The FOUNDRY

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Castings Form Important Link in Bus Transportation

GROWING popularity of the automobile as a medium of transportation, improving thousands of miles of main traveled highways and remarkable developments in the design of the automobile bus, all have been influential in stimulating the growth of bus lines until they serve practically every part of the country. Progress in bus transportation has been rapid since a few short years ago when the first jitney operator started out to make his fortune. Today over 270,000 miles of bus lines are operated in the

The Motorbus Is Becoming an Important Factor in Solving Transportation Problems in the City

United States. During the past year in the neighborhood of 21,000 companies operated approximately 80,000 busses and carried 1,500,000,000 passengers. Since the recent trend is toward the consolidation of many of the smaller companies and many lines are being operated by railroads and electric lines, the industry is reaching a sound financial basis. Benefits derived by the foundry industry from each progressive step recorded in the history of the different types of transportation also are developing in connection with mass transportation by motor vehicles. In addition to the heavy tonnage of cast parts required in the manufacture of the chassis, numerous castings, both of ferrous and nonferrous metals, are used in building the body. Many of the accessories necessary for bus operation also are cast

Find Where Castings May Be Sold

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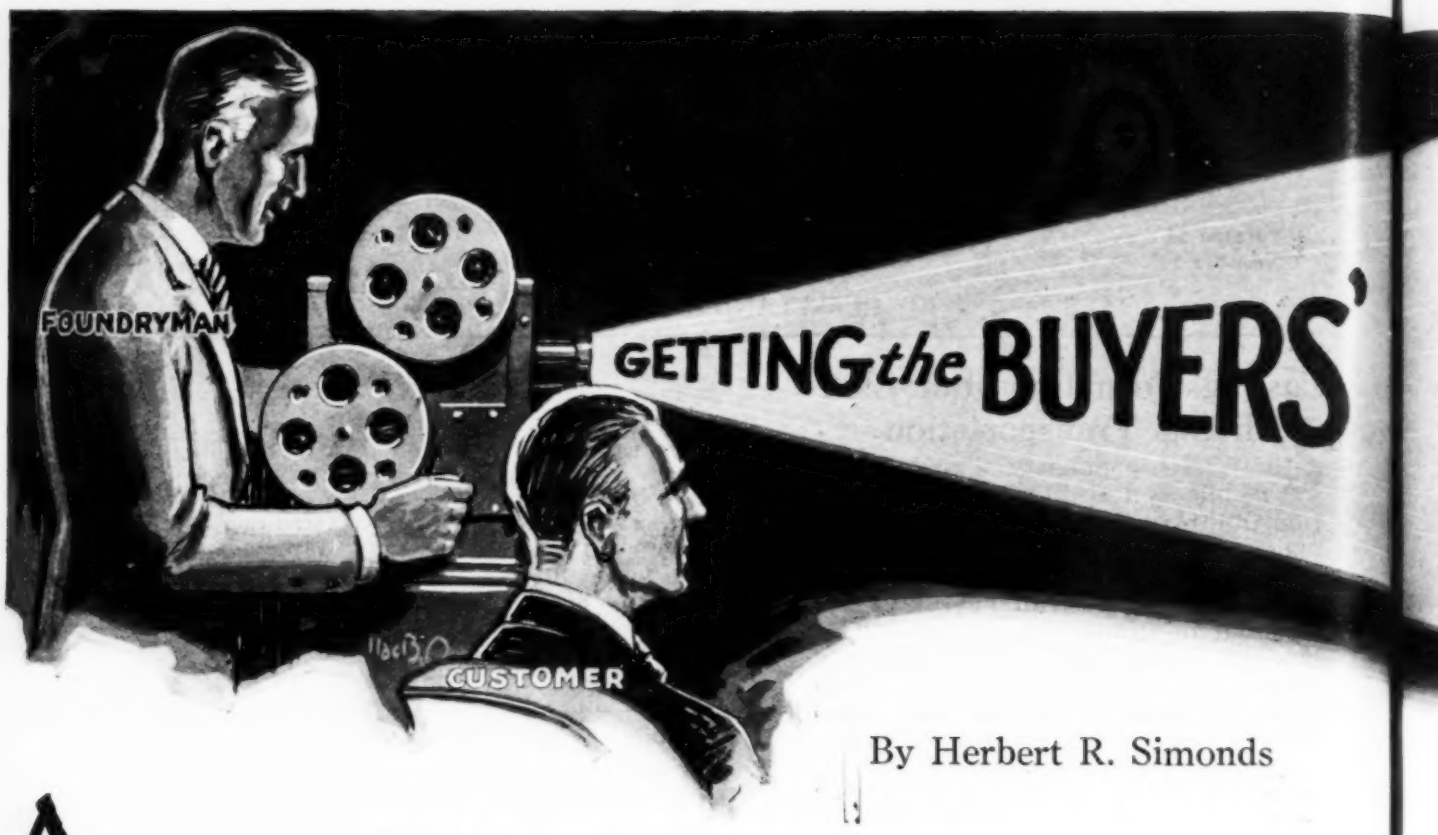


GETTING *the* BUYERS'

By Herbert R. Simonds

AN OLD Chinese proverb says: *One look equals a thousand words.* This is the slogan of two or three actual characters who in this article will be personified in the fictitious character of a salesman designated as Harry Paulson. Harry is a serious minded chap not given to enthusiastic outbursts usually associated with salesmen. Like the experienced insurance man he works only on prepared cases. He knows a great deal about a manufacturer's product before he asks for an interview. One of his principal assets is a backing of quality and service on the part of his firm.

Recently Harry solicited the business of a large valve manufacturer. He was ushered into the somewhat austere presence of a successful, experienced purchasing agent.

"Before we start talking castings, will you pardon a personal question or two?" asked Harry.

"Why! Certainly," said the somewhat surprised purchasing agent.

"Did you buy a new fur coat for your wife this year?" asked Harry.

"Yes."

"A good coat wasn't it?" continued Harry.

"Yes, it was. It cost a lot of money." Volunteered the purchasing agent.

"Now, Mr. Hard T. Sell," said Harry, "you don't ask her to wear a $3.95 hat with that coat, do you?"

"No, of course not, but aren't we getting pretty far afield?"

"Well, here's the point," said Harry as he started to open up his line of attack. "You produce a device which is a quality product—a fine fur coat among other valves, and yet you are attempting to buy a $3.95 hat in the shape of a casting to put on this quality machine."

Seeing Is Believing

The purchasing agent, although still somewhat skeptical of the new approach, was nevertheless interested, and asked just what Harry meant. At this point of the interview Harry pulled out of his pocket a casting of the same size and design as those used by the manufacturer, but of a better appearance. He placed this on the prospective buyer's desk alongside of a casting which happened to be there, and which the purchasing agent had said was the kind he now was using. The contrast was so startling, that interest was created and a new casting contract resulted.

Harry Paulson is something of a philosopher. He believes a good deal in what he calls *mute salesmanship.* Having made a demonstration he keeps quiet for a long time until questioned or forced to speak by the man he is interviewing. If he talks at all, he talks about the manufacturer's product. It is in that product that the manufacturer's chief interest lies.

The chances are that the castings that Harry Paulson has to sell are regarded by the buyer as merely incidental. Harry's problem is to make the buyer feel that improvement in his company's product somehow is linked, inextricably, with the quality of castings which only Harry's foundry is in a favorable position to supply satisfactorily.

Interested Attention

¶ *Price Plays But a Minor Role in Effective Selling of Castings. Value, Appearance and Service Outweigh Mere Cheapness,*

Elbert Hubbard has described the typical buyer as a man past middle life, spare, wrinkled, intelligent, cold, noncommittal, with eyes like a codfish, polite in contact, but unresponsive, and as composed as a concrete post. That description was written about 20 years ago, and either Mr. Hubbard was mistaken, or buyers have changed for certainly the typical buyer today is human and ready to admit the merit of any well presented case.

However the typical buyer as a rule represents and is acting for a larger business organization than the typical seller of castings. The man selling castings for the average foundry works under a handicap—the handicap of the amateur salesman in contact with the professional buyer.

Silence Is Golden

Probably the greatest fault with castings salesmen is that they think too much of price.

The story is told of a salesman in New England who secured his first interview with a seasoned buyer of textile castings. The buyer, with his back partly turned to the salesman, sat at his desk reading a newspaper during the entire interview, which was practically as follows:

THE SALESMAN:

"I understand you want 20,000 thread guides."

Buyer continues to read.

SALESMAN:

"We can make those for you for 9½ cents."

Buyer continues to read.

SALESMAN: (Takes out an old envelope from his pocket, does some figuring with a little stub of a pencil, and finally says:)

"Well, if we should get the full order, we could probably cut that to 8¾ cents."

Buyer continues to read.

SALESMAN: (Does some more figuring on another envelope which he takes out of his pocket.)

"I might as well tell you we are anxious for this business in order to keep our present force intact, and so if you will give me the order today, I will make you a flat price of 7 1/2 cents."

Buyer continues to read.

SALESMAN: (Getting more and more nervous all the time.)

"Well, how would 6½ cents sound to you?"

And the interview was concluded.

Applying the Lever of Price

When the next salesman, who happens to be Harry Paulson steps in, the purchaser puts down his newspaper and says:

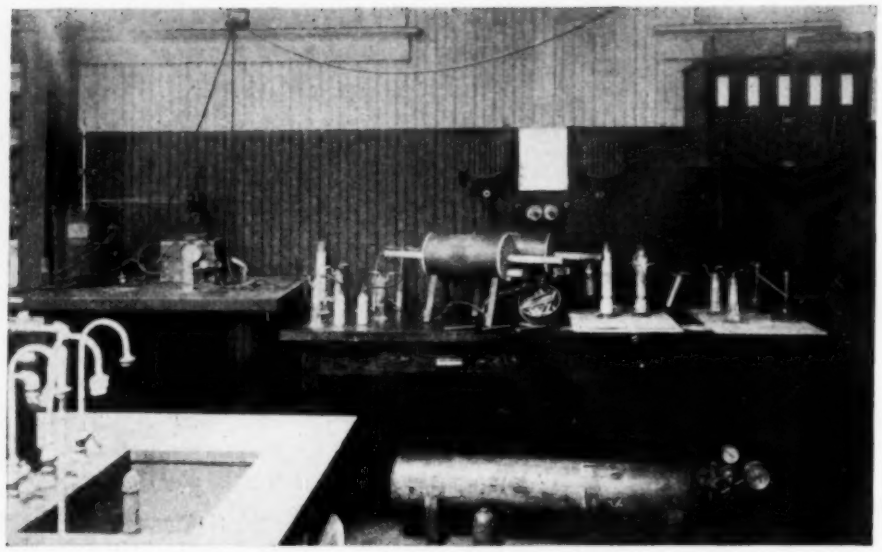
"Harry, Jones & Smith have quoted me 6½ cents on that lot of thread guides. Can you meet it?"

Whereupon Harry answers:

"You know as well as I do that I can't meet any such price as that, and, furthermore, you know that you can't afford to have anyone meet that price. Your thread guides are one of your chief selling features. They must not only be easily machineable, but must have a good finish because they occupy a conspicuous place on your machine."

At this point Harry takes the inevitable sample out of his pocket and places a beautiful thread guide casting in front of

The Bird That Cuts Prices



Quality is after all the most important factor in selling. A well equipped laboratory in the foundry is a big sales aid

the purchaser. Then after waiting until the purchaser had picked up the casting, he says, in a tone of confidence, but not too eagerly:

"We are prepared to furnish you castings similar to this, delivery 5000 within two weeks, and after that at the rate of 5000 a week. You know our plant and our reputation for service. Our own trucks will deliver these castings to your door at such times as best will suit your needs."

He says nothing about price, and as a matter of fact, the intelligent purchaser of castings takes up the question of price only after he has considered quality and service.

The Newark Foundrymen's association some time ago distributed to its members a card entitled *Price Cutting Is Peanut Salesmanship.* This card contains many crisp slogans and paragraphs decrying the evil of price cutting. A few of these are as follows:

Nothing is so easy as to cut prices, and nothing is so hard as to get them back once they have been pulled down.

No manufacturer can permanently keep up the standard of his goods if the price is persistently cut.

The price cutter admits his own failure as a salesman. He admits he has been defeated by the Marquis of Queensbury rules of business.

The price cutter scuttles the ship in which he himself is afloat.

In his travels Harry runs into a great many peculiar reasons why he might cut his prices. One time he stepped into the purchasing office of a small manufacturer of machine tools, and he was greeted with this.

"Now, Mr. Paulson, I'm glad you dropped in just at this time because yesterday I sold 200 of our machines at a price which won't net me a cent of profit. In fact, I'm commencing to doubt whether I can break even, and so I'm looking to you to cut your prices for the frames to 5 cents."

"Well, Mr. Osborne", said Harry, "if you want to starve to death, that is your own privilege, but don't ask me to lie down and starve beside you. We are furnishing a high quality frame casting at the lowest price which will show us a reasonable profit, and we have got to have that profit on every order we take."

The Lost Shall Be Found

One day another manufacturer of machine tools called Harry on the telephone and said he would have to cut the price of a certain casting from 8½ cents to 6½ cents in order to keep the work, as a competitor had bid 6½ cents. In this case the tonnage involved was large and the business attractive, so Harry said he would go to the manufacturer's plant, which was in a town about a hundred miles away, and talk the matter over in the purchasing agent's office. At the office he was greeted with:

"I'm sorry old man, but you've got to come down 2 cents or lose our work as the McInnis foundry has quoted us 6½ cents under exactly the same conditions."

Harry's reply was,

"You know our foundry, Mr. Blackstone, and you know we're rigged for production work on that job of yours. We've kept careful costs over a two year period, and are now making about 10 per cent profit. Considering the hazards of the industry, you surely do not think that is out of line."

Mr. Blackstone admitted that 10 per cent profit was fair enough, but he said he could not enter into an argument concerning the personal business affairs of the foundry from which he bought castings, and when an established concern like the McInnis foundry offered to make these at 6½ cents, he could not afford to let any personal consideration stand in the way. The result was that the McInnis foundry got the work and within a few days called at Harry's foundry for the patterns.

Service is important in selling castings. The jobbing foundry usually finds that it can give better service by having its own fleet of trucks

Three months later the representative of the McInnis foundry called on Mr. Blackstone and said,

"Those castings that we took at 6½ cents cannot be made for that figure, and we'll have to have more money."

Mr. Blackstone reminded the foundryman of the definite quotation at 6½ cents, and told him how he had taken the business from another foundry, because of the 6½ cent figure. The McInnis man replied:

"Well, we find it is impossible to make them at that figure, and you surely do not expect us to continue to furnish them at a loss. We'll make them for you at 8 cents."

Again Harry was called on the phone.

"This is Mr. Blackstone. You can have those castings back again from the McInnis foundry if you can make them for 8 cents."

Why Work for Nothing

Now Harry's foundry, like any other jobbing foundry, is occasionally extremely anxious for tonnage to help tide over a dull period. Even at such times it is the owner's strict policy not to take work at a loss, but the profit occasionally is cut. It happened that Mr. Blackstone called just at one of these periods when tonnage was earnestly needed, so Harry said he would take the order back at 8 cents.

The total result of this transaction was a blow to the entire foundry industry. The McInnis foundry lost money, and Harry's foundry lost the reasonable profit on a job of two year's standing. It always is hard to boost prices up when once they have been cut.

Harry frequently gets little glimpses of the way his competitors seek orders. He has many close friends among the purchasing agents upon whom he calls, and some of these who keep giving Harry orders at prices above competitor's quotations tell him anecdotes about other salesmen. One of the common stories is about a salesman who comes in with an air of mystery and in a kind of a confidential low tone asks,

"By the way, what are you paying for those lamp bases?"

If the purchasing agent tells him, he says in a sort of thoughtful manner,

"Is that so?"

Then, as if to give a little friendly assistance,

"Those are straight run castings, no cores, and you ought to get them at a lower price."

If the purchaser is interested, he may ask the gum-shoe salesman,

"What can you quote us?"

Then the salesman names a price perhaps a cent under the other quotation, and the deal may be closed. More often, if the purchaser is willing to dicker at all on the price, he will make a counter-offer below the salesman's quotation and a final price may be secured at two or even three cents below the original price. It sometimes happens that the original price stated by the purchaser was less than he was actually paying at the time.

Part of Harry's work is to educate the purchaser to the right point of view. He frequently asks,

This is a foundry cost department. Know your costs is the first advice to a castings salesman

"Do you want a foundry to make a profit?"

Naturally no sane person will deny that the foundry *should* make a profit, otherwise it cannot stay in business. Usually, when Harry is faced with the lower price offered by his competitor, he says:

"Of course, we get more than the Adams foundry. We ought to. We make a better casting"—and then he launches into his regular quality argument. When Harry does not know the purchaser well, and has met with a request to meet a competitor's price, he assumes an injured air—

"The idea of being able to lower a price as if I was in the second hand clothing business."

Dignity of Industry

Right here is an important point so often overlooked by castings salesmen, and that is, the dignity of the industry. One of the first qualities necessary to success in selling castings is confidence in the industry itself. Practically all successful castings salesmen believe thoroughly in the foundry business. They know their foundries are able to turn out excellent products, vitally necessary to the progress of the world. They have something good to offer, and people must pay the price to get it.

The successful salesman feels that he has a duty to discharge for the industry itself. In a great many cases, foundry salesmen are developed from the molding floor. A molder may show unusual alertness and energy. He becomes an assistant foreman, then a foreman, and later he is sent out on the road to sell castings. Unless the man is exceptional, he attains only the mechanic's viewpoint. He thinks in terms of price, and he cannot get the needed perspective on the industry as a whole.

The successful castings salesman must be a business man, and he should be enough of an engineer to know his product. Harry, one time, after closing a contract for a large tonnage of castings was able to show the purchaser where the castings could be lightened in weight without any loss in efficiency. The result was that he reduced the size of his own order, but he gained a confidence which has been a deciding factor in many subsequent contracts.

Extremely low prices frequently defeat themselves. This is especially true with large corporations where it is appreciated that those who furnish material must make a profit. One such large manufacturer frequently has refused to give a foundry business because its quotation was too low. This seems paradoxical, but it is true nevertheless. Experience shows that there is always grief connected with too

(*Concluded on Page* 535)

Auto Jobbing Keeps Floors Busy

Fig. 1—A crew of specialists is delegated to pour the molds

ANY reference to continuous molding and pouring methods almost invariably suggests a foundry thoroughly equipped with mechanical devices for handling the sand, molds, metal and castings. Shops engaged in the production of radiators, boilers and the castings used in the automotive industry are equipped and operated in this manner. The majority of foundries in which small brass castings are made, are operated on the continuous principle to the extent that metal is poured more or less intermittently throughout the duration of the working period.

In recent years the continuous principle has been adopted in several foundries where a diversified line of castings is made, but in practically every instance the castings are standardized and are ordered in immense quantities.

Considering the many advantages of the continuous method, the wonder is that it has not been adopted more extensively. Floor space is conserved, number of flasks required is reduced to a minimum, different operations may be segregated more thoroughly and thus distributed among a number of men to better advantage. Melting and distribution of metal are greatly simplified when spread over the entire day instead of being carried on under the greatest hurry and pressure in one or two hours in the afternoon.

Many mechanically equipped continuous foundries have been placed in operation since the Westinghouse Co. first adopted the plan in the air brake shops at Wilmerding more than 30 years ago. Only a comparatively small number of gray iron foundries engaged in the production of light castings have installed continuous methods without adding in any way to the mechanical installation. Many interesting features in a shop of this kind are presented in the foundry operated by the Erb-Joyce Foundry Co., at Vassar, Mich.

Several reasons are responsible for the selection of Vassar as the location of the company's manufacturing activities. The town is on the Pere Marquette and the Michigan Central railroad and the foundry occupies a strategic position that gives it access by spur switches to both roads. Vassar is a fairly central point between the various Michigan towns and cities engaged in the manufacture of automobiles and automobile parts. Detroit, where the company maintains an office in the General Motors building, is only 75 miles away, while Saginaw and Flint are 15 and 20 miles respectively. These and other towns where the company does business are within reasonable trucking distance, thus insuring prompt deliveries of castings to the customers.

The foundry building 100 x 200 feet was erected six or seven years ago to handle a general line of automobile engine castings, but through a combination of circumstances the venture was not a success and the shop remained idle and unoccupied until about two years ago when the present owners took it over and converted it into a going and exceedingly lively concern.

Practical foundrymen familiar with the problems involved in securing orders and in the merchandising of castings as well as with the technical problems involved in making the molds and melting the iron are making a success of the business in a crowded and highly competitive field. One of the reasons for their success is that they only accept work on which they know they can turn a profit. A second reason and one that is closely interwoven with the first is that the three men engaged in active supervision of the business have had many years active practical experience in the production of castings for the automobile industry.

Fred Erb formerly was manager of the Packard Motor Car Co., Detroit. B. A. Joyce has had extended experience in managing foundries in the Middle West including one of his own in Rochester, Mich., and Norman Wigley, resident Vassar manager of the plant had been chief metallurgist at the Central foundry of the General Motors Corp., Saginaw, Mich., since the plant opened in 1919.

Operation of the foundry is simplified to a considerable extent by concentrating on light castings and on castings that require no dry sand cores. A core oven is provided for drying the cores that are inevitable and for the cores required in making one style of tappet. However, the great bulk of the castings are of a type suitable for mounting on hand or power squeezers. They require no cores, they are ordered in large numbers and they are mounted in a manner requiring a

gShop rsBusy

Fig. 3—Wheelbarrows are employed to return flasks and plates to the molding stations

minimum amount of skill on the part of the operators. In weight the castings range from a little over an ounce up to 44 pounds.

Available supply of labor is ample and satisfactory. It is recruited from the country within a radius of 20 miles. In the beginning a nucleus of a crew was recruited from those who had worked in the foundry during its former active period. As the scope of operations increased these men induced relatives and friends to join them and in that manner the staff increased automatically without any effort on the part of the proprietors.

Beginners are set at the simpler tasks, shifting weights, shaking out, pouring iron, preparing the sand, etc., and after they have become familiar with the shop terms, materials, methods and conditions, they are assigned to one of the molding machines.

All the employes are white. The majority are native born and almost without exception are quick and intelligent and rapidly develop into skilled operators. A daily heat of 50 to 60 tons is required to pour the molds made on 46 molding machines by 50 operators. Of course this does not mean that each molder alone is responsible for over a ton of castings. On account of the manner in which the work is divided the tonnage must be pro-rated among the entire 175 employes in the foundry at the time these data were collected. At that time preparations were on foot to increase the output so that by this time in all probability it is much greater. Ultimately it is expected that a daily heat of 100 tons will be maintained. A second foundry alongside the first now is in use.

The building is of a substantial concrete block construction with steel columns and beams supporting a wood roof. Windows along both sides of a high monitor on the roof insure excellent lighting conditions over the center bay of the foundry. The side bays are lighted from windows in the side and end walls of the building.

Ventilation, which in many foundries presents a feature of the greatest importance, is here so negligible that it attracts no attention. The castings are so light that only a little smoke and steam are produced when they are poured and shaken out. Also the practice of taking each bull ladle of iron from the cupola and distributing it by hand ladles to different parts of the floor, helps to prevent any great production of steam, smoke or dust. The air is clear at all times and the light is good.

Floor space arbitrarily is laid out in three main divisions by two rows of columns that extend through the center of the building from end to end and support the roof beams. In the original installation they also were designed to support crane runways. The crane bridges still are in place, but are not needed under present operating conditions.

Three bays into which the shop is divided are respectively 30, 40 and 30 feet in width. The center bay and one side bay are used exclusively for molding purposes. The third bay is devoted to several activities. The cleaning department equipped with tumbling barrels, grinding wheels and sorting benches and partly shown in Fig. 6, occupies approximately one-third of the space. The center section of the bay is occupied by the cupola department, separated on the right and left from the remainder of the bay by partition walls which also support the charging floor. The coremaking department with a rack type oven occupies part of the space in third section of the bay. The remainder of the space is used by

Fig. 2—The cupola is kept in blast all day

molders working on odd jobs and short orders. At present molding machines are set up along one side of the two molding bays.

Team work has been developed along several lines to meet existing conditions. For example, three men make the molds for the tappet valves illustrated in Fig. 7. The man to the left makes the drag, the man in the center makes the cheek and the man to the right makes the cope. The majority of the floors are operated in the manner shown in Fig. 5. Each man on a machine makes a drag and cope and closes the mold on a small bench set conveniently close at hand so that the molder has only to take the minimum number of steps in conveying the mold from the machine to the bench. Two men constantly on the move lift the molds from a dozen benches and place them on the floor.

Fig. 4—Molds are poured and shaken out continuously

Molds shown in Fig. 4 are handled in a somewhat different manner. This is one of the largest jobs handled in the shop a flywheel housing weighing 16 pounds. A crew of six men make 350 molds a day. Two men make the drags on a rollover machine supplied by the Grimes Molding Machine Co., Detroit. Two men make the copes on a jolt strip squeeze machine made by the Osborn Mfg. Co., Cleveland, and two men carry the mold parts out on the floor, close and clamp them ready for pouring. Not more than 20 molds accumulate on the floor before they are poured and the flasks are returned to the molding station. The entire flask supply is only 25.

Some form of mechanical conveyor would be the ideal medium for handling this job particularly for returning the flasks to the molding station and for taking the castings to the cleaning department. The wheelbarrow type of conveyor shown in Fig. 3 rendered fairly satisfactory service before a gravity conveyor was installed.

All the men are paid on a piece rate based on the number of good castings produced. Therefore, each one is vitally interested in seeing not only that his own part of the program is carried out to the best of his ability, but that the group to which he belongs functions as a whole in a satisfactory manner.

Members of the pouring gang who follow the ladle and pour all the molds are paid on the same basis. It is claimed this method presents an advantage over the usual method by which the wage is based on the number of ladles of metal poured. By basing the wage on the tonnage of good castings the perception of the pouring gang is sharpened. They will not pour metal in a dirty runner. They will not pour a casting short. They are just as much interested as the man who made the mold in turning out a saleable casting. Constant practice renders them adepts in handling the metal with speed and skill.

Problem of handling all the sand required for a day's operation on a limited floor space has been solved in an ingenious and simple manner in keeping with the general scheme of simplicity which characterizes all the operations. In the morning each molder finds a sufficient supply of sand close to his machine to carry him through the day. After the first set of molds have been poured on the floor they are shaken out right there, the castings are removed, the sand is wet down and flattened out to serve as a bed for the following set. Each succeeding group is treated in a similar manner until by the close of the day the sand is piled approximately 20 inches deep over each floor. A night gang of five men assisted by a horse and a sand cutter made by the Production Equipment Co., Cleveland, prepare all the sand and throw it up in suitable heaps close to each molding machine.

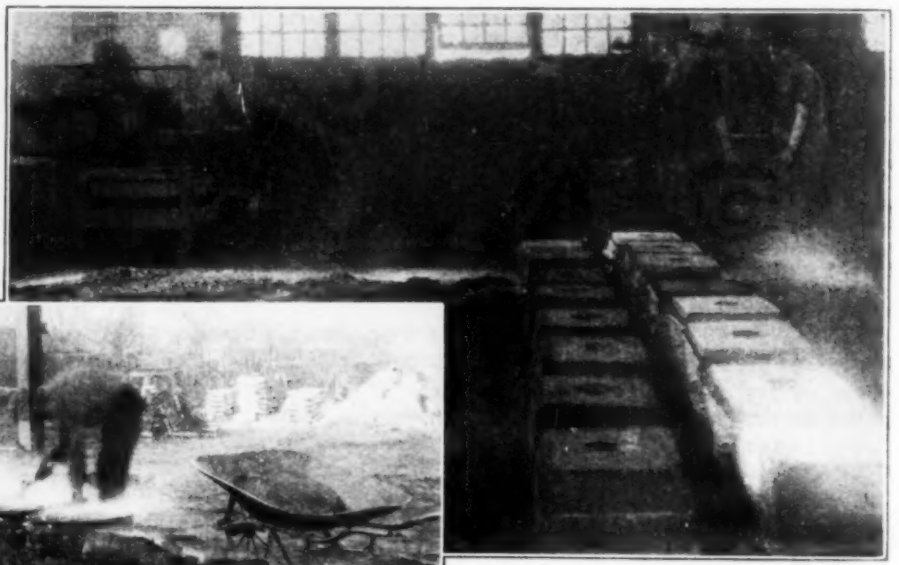


Fig. 5—Machine men place the completed molds on stands. Other men place them on the floor

Castings are divided into three general groups according to the judgment of the foundry superintendent and three different grades of sand are provided for molding these groups. Thus one is fine, one is coarse and one is between the two extremes. In the majority of instances the sand from the heap is shoveled directly into the flask, but in a few molds a handful or two of coal dust facing is used at strategic points to insure a clean, smooth surface. Once a week the entire sand supply is put through a ¼-inch riddle.

One method for making small tappet valves is shown in Fig. 7. The molds are made in green sand. In a second method dry sand cores are employed to form the greater part of

the casting. In both methods the flat or working face of the valve is cast against an iron plate to impart a slight chill. Only 1/64-inch metal is allowed on the face to be finished by grinding and for that reason it is essential that the castings present a perfect surface leaving the molds. The least sign of a pit or a chill wave will condemn them.

A stack of the chill plates is shown to the extreme left of the illustration Fig. 7. Four plates arranged side by side are rammed in each drag and each plate imparts a chill to eight castings. The drag is rammed on a plain squeeze machine, lifted off and rolled on the stand shown where the other two operators in turn place the cheek and the cope in place before the entire mold is lifted away and placed on the floor to be poured.

The cheek part is made on a stripping plate jolt machine made by the Milwaukee Foundry Equipment Co., Milwaukee, located close to the wall and the cope is squeezed on the machine shown slightly to the right of the center in the same illustration. The drag requires no reinforcement, but a steel band is placed in the cheek and another one in the cope. Production on this floor is 400 molds per day and with 32 castings in each mold the daily output of tappets is 12,800.

A cupola with a 60-inch shell, lined to 42 inches and made by the Whiting Corp., Harvey, Ill., is kept in blast all day. It is repaired at night and made ready for the following day's heat. Blast is supplied by a fan located on the charging floor and connected to the wind belt of the cupola by a vertical pipe and an elbow which may be noted in Fig. 2.

Fig. 7—Small chill plates are rammed in the drag of the three-part flask employed in molding small valves

Charges are made up to yield an anticipated approximate analysis in the castings as follows: Silicon, 2.25 per cent; sulphur, 0.08 per cent; phosphorus, 0.25 per cent and manganese 0.50 per cent. Each of the iron charges weighs 1000 pounds and they are separated by 125-pound splits of coke. The first bed in the cupola is carried 42 inches above the tuyeres and a double split of coke is employed about the middle of the heat to renew the bed and compensate for the coke burned during the idle noon period.

Pour Radiator Castings With Hot Metal

Question: What do you think of the practice of using small quantities of aluminum in molten iron designed to be poured into radiator castings. What is considered a good analysis for these castings.

Answer: Without attempting to touch on the scientific reason for the phenomenon, it is sufficient for all practical purposes to say that the addition of a small quantity of aluminum to a ladle of molten iron increases the *life* of the metal so that it runs more readily in the mold. For that reason and under certain circumstances its use may be permissible. It has a slight corrective value. However, if there is one foundry more than another where cold iron should have no place, that shop is where radiator castings are made. Cold iron is responsible for nearly all the scrap made in this industry and the foundryman's effort should be directed toward increasing the temperature of the iron as it leaves the cupola instead of trying to doctor it in the ladle. None of the big radiator companies countenance the use of aluminum in the ladles. Invariably their cupola practice has been developed to a point where the metal comes blazing from the spout. Radiator castings are not held to close chemical specifications. Any iron with a fairly close grain, medium strength and which may be drilled and reamed at a reasonable speed is satisfactory. An approximate analysis of a suitable iron would show silicon, 2.00-2.25 per cent; sulphur, 0.08 per cent; phosphorus, 0.30-0.50 per cent; manganese, 0.50-0.70.

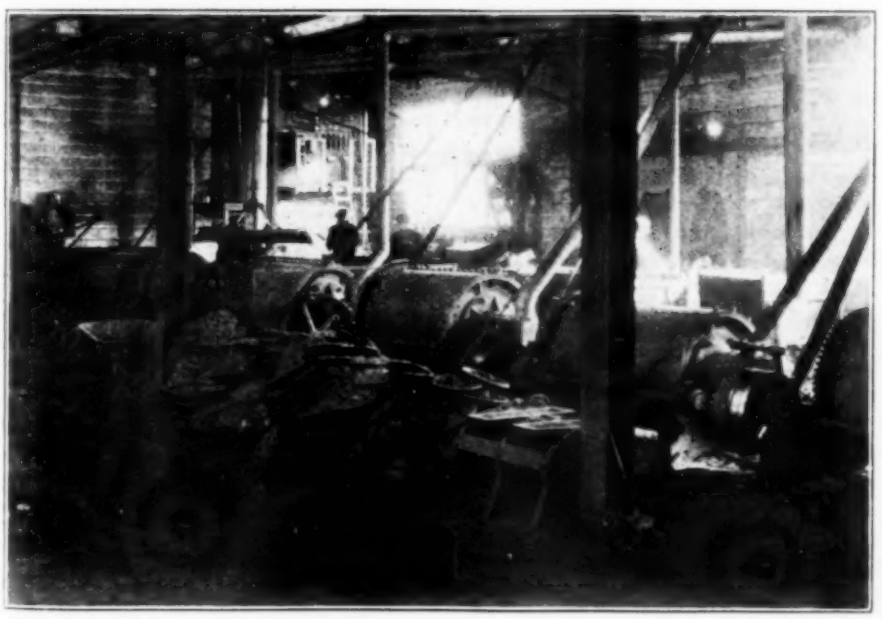


Fig. 6—The cleaning room is equipped with tumbling barrels, grinding wheels and sorting benches

A good bond for cores used in making aluminum castings is stated to consist of equal parts of linseed oil and molasses. This bond is used in the ratio of 1 part of the mixture to 30 parts of dry sea sand.

Grade Apprentices by Merit

Molder Apprentices in the Plant Are Grouped Into Three Classes—Earn and Learn Method Is Employed in Advancing Them from One Group to Another

By C. Howard Ross

EXPERIENCE in the past has necessitated a training program in the following four directions: Night school work, training foremen from the ranks, introduction of university leaders, apprenticeship training in the crafts by the upgrading method.

The first three plans of necessity must enter into this paper only from the discussion standpoint.

Under careful supervision and with proper human follow up we present the fourth or earn and learn method by which young men, exceeding 18 years of age and possessing the equivalent of an eighth grade education, may enter a craft training program and secure a livelihood in conjunction with mental progress.

The following items are of interest when young men are introduced into plant activities, enabling their performance to be progressive: Careful selection based on physical stability, accurate instruction, sincere and human follow up, pleasant surroundings, with special emphasis upon good factory housekeeping, dignity of the craft, ability to earn, inclination to learn, future usefulness.

An aggressive operation of the apprenticeship system, whereby men are able to earn and learn by the upgrading method, obtains best results when the right men are encouraged to stay and the unfit deliberately are eliminated.

During the highest peak, our school included the following personnel: Director, instructing foremen, apprentice molders, coremaker apprentices, pattern maker apprentices.

Molder apprentices are introduced into the foundry at an arbitrary day rate of 40 cents per hour, which protects them over a two weeks' period. During this time, instructing foremen will initiate their experience with at least five short order jobs.

Upon termination of two weeks' primary activity with the five molding jobs completed, foundry apprentices then are placed upon a piece rate basis.

It has been our experience that the better quality of men, by their own efforts, can earn the equivalent of 35 to 40 cents per hour, during their third week. By the last day of their fourth week, 40 cents per hour has been secured without question.

The apprentice then faces the beginning of his fifth week as a $20 man. The better grade young men have been able to gain $1 per week for the next 20 weeks. Thus, in heavy production season, when tension is high, young men, exceeding 18 years of age, have been able to earn and learn consistently and some of the higher grade have drawn $40 per week at the termination of the first six months' period. These are special men of good mental and physical caliber. Average apprentices of fair stability, with four to six months' experience, are able to draw about $100 per month.

C. Howard Ross, who presented a paper on the upgrading of foundry apprentices, before the apprentice training session of the Chicago meeting, is a graduate of the university of Michigan of the class of 1916. Following his graduation Mr. Ross spent some time in teaching in public schools and at universities with an intervening period of two years' service in the United States army during the World war, when he served both at home and abroad. He has worked in various capacities in malleable iron plants. Starting as an apprentice molder he has risen to his present position as manager of the Union Malleable Iron Co., East Moline, Ill. In his present position he has given a great deal of time and thought to training workers and has been instrumental in developing the local apprentice training program now in force in the foundries of the Quad-Cities.

Molding apprentices are classified on the following bases, indicating qualifications demanded in order to secure promotion from lower to intermediate and high grades:

1 Class *B:*

A. Inexperienced in foundry craft, but a fair subject for upgrading training over a six months' period.

B. Eighth grade education.

C. Minimum weight: 140 pounds.

D. Minimum height: 5 feet 8 inches.

E. Intelligence sufficiently evident to receive instructions.

F. Ambition to earn and learn.

2. Class *A:*

A. Six months' experience.

B. Twenty-five jobs.

C. Scrap under 5 per cent.

D. Earnings: $5 per day.

E. Demonstrated mentality to absorb class room work.

3. Junior Journeymen:

A. Twelve months' experience.

B. Fifty jobs, of squeezer, bench, loose work and floor types.

C. Scrap under 4 per cent.

D. Earnings: $6 per day.

E. Demonstrated mentality to absorb class room work.

F. Amiable personal makeup with unquestionable ability leading to a future high-grade mechanic, with possible leanings toward an appointment on the supervisory force.

Special class room instruction is offered for the groups, as follows:

(a) For class *B* apprentices, we recommend no class room instruction, but insist upon a mass meeting once a month for the presentation of policies, general encouragement and brief lectures.

(b) Class *A* apprentices and junior journeymen will be enabled by their own choice to elect courses in the following subjects:

1. Foundry engineering.
2. Metallurgy.
3. Shop arithmetic.
4. Business economics.
5. Industrial seminar.

4. Journeymen:

Any class *A* or class *B* apprentice or junior journeyman, who has been allowed to remain on the job for three years and who warrants further employment, will be promoted to the rank of journeyman molder. It is possible, therefore, that a class *B* apprentice may effect a short cut from the lowest rank to the highest, but he will forfeit the right to his assignment of major jobs and he will not be considered as possible foreman material. This forfeiture is not necessarily through any direct fault of a man, but through his inherited mediocre mentality.

Graduation exercises occur once or twice yearly, according to the situation that confronts us. Diplomas are presented, witnessed by the entire assembly personnel of the plant. Short speeches of congratulation, encouragement and progressive outlook are offered by company officials. A word of instruction, comparing old and new methods of apprenticeship training, generally is rendered by a seasoned molder veteran, who is proud of 33 years' foundry experience. Acknowledgement then is rendered by a junior journeyman or newly created journeyman, who in the past has expressed in acceptable terms the hopes, ambitions and appreciation of the graduating class.

Class room and lecture work gradually is taking permanent form. Within a few years' time, we probably will be satisfied with it sufficiently to recommend it. To date, we have butchered our collected data considerably and will continue to do so until we are satisfied with it. In the meantime, we do not recommend it with any greater degree of alacrity than we would recommend a half-built house for occupancy.

Within our program, we have no place for the 16-year old boy. We feel, however, that he has a proper niche in industry and other firms have made room for him.

This paper merely outlines personnel classification by work to be accomplished.

Under the most careful craft instruction and deliberate follow up, the best selected material will dwindle to about 25 per cent of the initial figure within a year's time. We feel that 40 per cent would represent a high salvage figure.

Certain enthusiasts in apprenticeship training have announced, thunderously, that the main object of the apprenticeship school is to make men. They are apt to lay little or limited stress upon production demands. We believe there is much fallacy in such a one-sided opinion. By our earn and learn method, we hope, not only to make men, but also to make castings with dignity of training and net profit of fabrication properly weighed and related.

Revises Uniform Trade Customs

A COMMITTEE recently has revised the uniform trade customs of the Ohio State Foundrymen's association, bringing them up to date to meet changing conditions in the industry. Many of the members of the association print the customs on their quotation forms or otherwise make them a definite part of the conditions under which they do business.

These trade customs now endorse the placing of weights of castings on blueprints supplied for the purpose of making quotations. The customs also include the standardized colors for patterns and core boxes adopted by the A. F. A. joint committee on pattern standardization.

The uniform trade customs used by the Ohio State Foundrymen's association are as follows:

1. For estimating purposes, blueprints submitted must be marked with rough casting weight, if known, or an estimated weight upon which quotation will be based.

2. Patterns to be in condition to make castings of the quality and quantity required.

3. Correctness of patterns and core boxes to blueprints rests with customer.

4. If pattern require follow boards or boards for molding equipment, they must be furnished by customer. On patterns requiring stopping off or if skeleton patterns are furnished, an extra charge will be made. Repairs and changes in patterns by customer's order at expense of customer. Patterns to be painted the following standard pattern colors: Surfaces to be left unfinished are to be painted black. Surfaces to be machined are to be painted red. Seats of and for loose pieces are to be red stripes on a yellow background. Core prints and seats for loose core prints are to be painted yellow. Stop-offs are to be indicated by diagonal black stripes on a yellow base.

5. All patterns, core boxes and loose pieces thereof should be properly marked for identification.

6. All freight, drayage, boxing and crating on patterns to and from foundry at expense of customer.

7. Foundry not responsible for loss of or damage to patterns by fire or other casualties beyond its control.

8. Patterns not in use for a period of six months shall be subject to storage charges.

9. The foundry is responsible only to the extent of replacing castings rejected due to foundry defects, and such castings must be reported or returned to the maker within 90 days after shipment. The foundry is not responsible for labor charges, loss or damage caused by defective castings. In case of nonferrous castings the full weight of the original castings rejected must be accounted for or returned to the manufacturer.

10. Claims for error in weight or number must be made within five days after receipt of casting.

11. All castings are sold as rough castings f.o.b. foundry. Terms, 30 days net from date of invoice, unless otherwise stated.

12. If the customer requires special production service to secure quick delivery, an extra charge shall be made.

13. No order shall be changed unless notice of revision is made in writing and received by foundry before the work is in process. In case work is in process, customers to be charged with any castings made and cost of cores or molds discarded due to change in patterns or core boxes.

14. Foundry shall not be liable in damages for failure to deliver caused by fires, strikes, differences with employes, accidents, or other causes beyond its control.

15. Cancellation of orders are to be made only by mutual consent.

16. Unless otherwise agreed, quotations must be accepted and patterns furnished within 30 days from date of quotation.

17. Any quotation containing more than one class of work, or more than one itemized price, is furnished with the understanding that acceptance is for the entire lot as submitted.

Control Pipe Foundry Sand

Comparison of Properties of Sands Used in 15 Different Pipe Shops Revealed Wide Differences in Permeability, Dry and Green Strength and Moisture Content

By M. Kuniansky

FOR the past two and a half years our laboratory has been performing routine sand control work with a fair degree of success. Our losses in the various departments have been lowered and some of this reduction rightly can be attributed to sand control. We have endeavored to keep our sand within certain limits for permeability, moisture, green strength and dry strength, for we feel that it is just as important to control the sand as it is to keep the iron mixture within certain limits.

One naturally would assume that the sand used for ramming the molds for the same size of pipe would be approximately the same in various shops, but the testing of the sand used in the mold for a 6-inch pipe from 15 different shops varied enough to merit special study.

Results of tests of sands from the various shops are tabulated in Table I. It is evident that all four factors, permeability, green strength, dry strength, and moisture, varied more than was anticipated.

Change Moisture Content

Lynchburg sand with 15 per cent moisture looked high to us, so we started to lower it. By the time we reached 11 per cent we were in trouble. We found that jolt ramming of the type we used required a wet sand. In jolting a 16-foot mold vertically the sand toward the top of the mold suffered from aeration when the moisture dropped to 12 per cent. The result was a weak mold at a point about 2 feet below the bell. Upon pouring, the iron washed this portion badly. With pneumatic ramming, used with sand No. 1, a low moisture is required. As the moisture goes up on this type of ramming the speed of ramming is cut down and when the moisture is 12 per cent, the speed of ramming is cut almost in half.

Green and dry strengths are run on a testing machine designed by Dietert, using the permeability specimen. Several sands in Table I, illustrate the importance of controlling both green and dry sand strength. Sand No. 1 and sand No. 11 are used in the centrifugal process for making pipe. In this process sand is an important factor in the success of the plant. Sand No. 11 is used in a shop where the 16-foot molds are rammed by jolting. Sand No. 1 is used in a shop where the molds are rammed pneumatically. I have picked these two sands because they show the importance of sand control better than any others. Sand No. 11 has 3.1 per cent more moisture than No. 1. The reason for this difference is in the method used for ramming.

Tests Show Variation

IN A series of tests conducted with sands selected from 15 different foundries engaged in the production of cast iron pipe, startling differences were noted in comparing the permeability, moisture content and strength in the green and dried state. Each sand was giving eminent satisfaction in the foundry where it was used and the result of the various tests seemed to indicate that local conditions, particularly the method of ramming the sand, is the most important factor to be considered. Tests referred to in this paper presented at the recent convention of the American Foundrymen's association in Chicago June 6-10, were carried out at the plant of the Lynchburg Foundry Co., Lynchburg, Va., of which the author M. Kuniansky is chief chemist.

The shaking-out process is different at the two plants. In the mono-cast shop the sand is cut out of the flask and in the sand spun shop it is jolted out. If the sand bakes too hard from the skin drying before casting and from the pouring operation, it will be almost impossible to cut the sand from the mold in commercially practicable time. The jolt shaking-out process is not handicapped as badly for this. The sand must be sufficiently strong in the green state to withstand the ordinary handling operations previous to pouring and must dry sufficiently hard to withstand the flow of the metal. A sand low in dry strength washes badly during the casting operation.

In the old style of making pipe, it is necessary to have sufficient green strength to permit the rough handling of the rammed mold from the ramming station to the drying station. The dry strength must be sufficiently great to permit the rough core setting operation to take place without raking the mold, although it is not always true that the resistance of the mold to raking by the setting of the core is greater with higher dry sand strength. Sand No. 14 in the dry state was the weakest ever tested by the writer, yet some of the pipe make from this sand looked good. If the sand is too strong in the dry state there is a tendency for the heads of the pipe to drop off. We have had as many as 15 heads drop off where the sand was too strong. Where a sand runner is used and pipe are cast bell up, the runner sand should be strong when dried. Where the head core is nailed, the head core will rise if the runner sand is too weak.

Permeability Is Important

Permeability plays an important part in the drying operation. Less fuel is required to dry a mold of permeability 350 and moisture 15.0 per cent than it does to dry one of permeability 70 and moisture 9 per cent. When permeability of head core sand is high, we have less trouble from blowholes in the sockets. Oil sand head cores have been used at our Lynchburg plant for the past month with almost absolute freedom from blow holes in the sockets due largely to the higher permeability of the rammed head core. It is almost impossible to ram the head cores too hard when using oil sand.

Permeability tests are run according to the American Foundrymen's association method, though the writer believes that one orifice is better than two. Difficulty is experienced in obtaining check determinations on the two orifices on sand No. 8 and sand No. 10. The shear machine of Dietert is an improvement over the compression machine formerly put out. Use of the permeability specimen for the strength test saves time and also

gives a truer relationship between permeability and strength.

The moisture test as outlined by Dietert will not give reliable results on most of the pipe shop sand given in Table I. It is almost impossible to check these readings for moisture by actual weighing. On sands like No. 1 and No. 11, and on sand in the fitting foundry, where we use a sand-slinger, moistures can be checked within one third of one per cent.

In the American Foundrymen's association *Transactions*, I find curves giving the characteristics of a molding sand through the entire range of workable moistures. In Table II are the results obtained on sand used in the fittings foundry. In Table III are the results obtained by drying the sand at 105 degrees Cent. and retempering to the indicated moistures. Tables IV and V give the same results on our pipe shop molding sand. The samples are taken at one time and carefully mixed. Half the sand is used for the determinations in Tables II and IV and the other half in each case is dried and used for the results in Tables III and V.

Table II shows a variation from 55 to 62 in permeability. Green strength checks fairly close. Dry strength, however, is erratic. In Table III the sand when reworked to 9.0 per cent moisture and which showed 8.9 per cent when checked by loss in weight cannot be recognized as the same sand in Table II.

In Table IV on the the coarse pipe shop sand the results check fairly well. In Table V, however, the sand when reworked to 14 per cent and 15 per cent moisture aside from the higher green strength looks something like the sand in Table IV. We cannot see and cannot explain why the same sand when dried at 105 degrees Cent. and reworked to its original moisture should not give the same results as were obtained before drying.

In conclusion we wish to emphasize the fact that despite the variations obtained on sands used at different shops for making the same casting, that there are benefits to be derived from routine sand control. It merely resolves itself to finding the type of sand suited for your particular shop, fixing the limits within which to keep the moisture, permeability and strength and then keeping it as nearly the same from day to day as possible. The results obtained are at least a basis for an intelligent comparison from day to day.

Results of Detailed Tests

Table I

Sample No.	Permeability	Green strength	Dry strength	Moisture Per cent	Plant
1	313	0.7	7.8	6.9	Mono-Cast
2	275	0.8	8.8	7.6	Acipco
3	193	0.9	8.6	12.4	Acipco
4	119	0.55	3.2	10.5	Scotdale
5	358	0.75	8.0	10.2	Bessemer
6	300	0.7	8.6	13.2	National
7	185	0.6	4.0	13.2	Radford
8	380	0.5	12.2	14.9	Lynchburg
9	198	0.85	2.8	9.8	Clow
10	67	0.82	2.4	9.6	R. D. Wood
11	151	0.73	11.4	10.0	Sand Spun
12	99	1.0	5.4	13.2	Chattanooga
13	112	1.35	7.8	15.7	Addyston
14	173	0.60	1.8	11.9	Burlington
15	156	1.5	9.8	7.4	Clow

Table II

Permeability	Green strength	Dry strength	Moisture per cent
62	1.8	28.6	8.9
62	2.2	21.4	8.8
67	2.1	20.6	8.7
62	1.8	15.8	8.8
55	1.9	21.4	8.8

Table III

Permeability	Green strength	Dry strength	Moisture per cent	Per cent moisture checked by weighing
23.4	1.2	5.8	6.0	....
33.0	2.5	10.2	7.0	...
42.0	3.15	14.0	8.0	....
44.0	2.0	16.4	9.0	8.9
38.0	2.0	23.2	10.0	9.7

Table IV

Permeability	Green strength	Dry strength	Moisture per cent
275	0.5	17.0	14.5
264	0.5	19.0	14.3
243	0.52	.....	.....
275	....	18.5	14.5
275	....	.....	.....

Table V

Permeability	Green strength	Dry strength	Moisture per cent
205	0.85	11.0	11.0
198	0.8	11.8	12.0
236	0.7	17.6	13.0
253	0.8	18.4	14.0
219	0.7	23.2	15.0

Low Bed Cause of Cold Metal at Spout

Question: Will you kindly advise us how to change our cupola practice to secure hot iron? The cupola is lined to 32 inches and is provided with six tuyeres 11 x 6 inches 14 inches above the sand bed. We place 500 pounds by-product coke on the bed and 250 pounds thereafter between 1000-pound charges of iron.

Answer: Cold iron may be due to any one or a combination of many factors. In your case it is due primarily to a low bed. Coke varies in weight from 23 to 32 pounds per cubic foot, therefore we cannot tell you how many pounds to place on the bed. Fortunately another method is available for gaging the coke ratio and that is the height the coke must extend, above the tuyeres to secure the highest temperature during combustion. This point is 8 or 10 inches above the tuyeres, but the bed must extend approximately 30 inches above the tuyeres at the time of charging the iron to allow for the reduction in height that takes place before the iron commences to melt. Your cupola contains approximately 28 cubic feet in the space between the bottom and a point 30 inches above the tuyeres, therefore if your coke only weighs 23 pounds to the cubic foot you will require 650 pounds on the bed. In the event that your coke is heavy, 32 pounds to the cubic foot, you will need almost 900 pounds on the bed. However, your total coke consumption may be reduced considerably. You are placing too much coke between the charges. With a bed the proper height 150 pounds will be ample between succeeding charges of iron. You do not state whether the furnace is kept in blast for a long or a short period. If you are running long heats, you will find it advisable to reduce the iron charges to about 700 pounds and use about 100 pounds of coke between charges.

Acquires New Process

The Chicago Reduction Co., Chicago, has acquired the process developed by Seglen Svendson for the production of alumina. The process is said to be adapted for siliceous raw materials such as common clay and bauxite of high silica content. Pure silica is claimed to be a by-product of the process.

Metal Is *Still-Cast*

By P. H. G. Durville

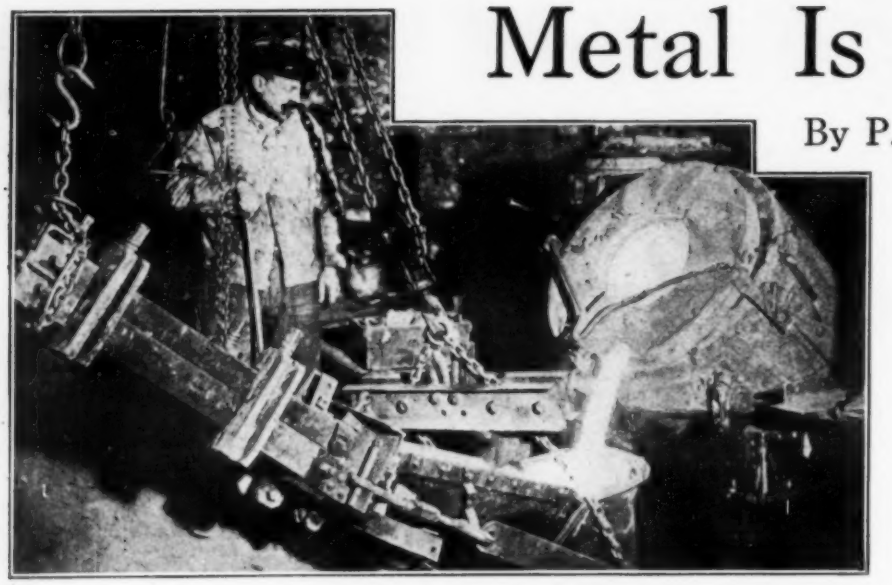


Fig. 1—Filling the Pouring Ladle Attached to the Mold. The Ladle and Mold Are Fastened Together Rigidly, and After the Proper Amount of Metal Is in the Ladle, the Device Is Tilted Slowly in a Vertical Plane

ANY metal which contains even a small percentage of aluminum possesses certain peculiarities of appearance and properties which are exhibited both when the metal is melted and after it solidifies. Pure aluminum, or an alloy containing a small proportion of aluminum, can be melted without flux—except for a layer of charcoal—because a film of oxide and metal forms at the surface of melted aluminum. Although thin, this film is air-proof, and it prevents the metal underneath from oxidizing. This oxidized film does not move easily on account of its toughness and high surface tension.

One important point in connection with this process of still casting has not been stressed strongly enough, namely, that the same kind of surface film with the same peculiarities forms over the surface of all melted alloys that contain even a small proportion of aluminum. Experienced foundrymen know how desirable it is to cast aluminum under its *skin* or under the surface of the film which tends to remain still.

In the case of red copper, when in fusion, the surface shows pure copper only. This is due to the fact that liquid copper constantly absorbs the copper oxide which forms on the surface. By closely examining smelting copper the oxide can be seen dissolving in the bath, and going into solution just as pulverized sugar dissolves in water. When copper is cast in the open, either in wire bars or cakes, the surface of metal exposed to the air is covered by a film of black oxide that cannot be absorbed by the metal.

When aluminum is added to copper in even such small amounts as 0.50 to 0.75 per cent, the surface of the alloy shows a totally different aspect from the surface of copper alone. A film similar to the one formed on the molten aluminum forms on the alloy of copper-aluminum. This film, like the one on pure molten aluminum, is rigid and coherent, and does not dissolve in the copper. This skin, or film often is described erroneously as foam and is so stiff that it crumples up when removed by a skimmer. A new film instantly forms behind the skimmer and covers the exposed surface. This phenomenon repeats itself indefinitely, and the raw material is never visible.

The surface of cast ingots of copper-aluminum alloy does not show the black film of the oxide of copper, but shows instead a bright-red or gold-colored film, crumpled and creased similar to the pure aluminum seen when freshly cast into ingots. Due to the presence of aluminum there is a tendency to shrinkage, and this shrinkage appears on the top face of the ingot where there is a sinking around the crystals already formed.

Exactly the same result follows the addition of aluminum to brass. The zinc fumes rising from the surface of the melted metal are oxidized immediately. The resulting oxide is a grayish-white powder; most of which remains on the surface of the bath and has the appearance of incandescent moss, although some escapes into the air and is lost entirely.

When brasses are cast into ingots in the open air a dull gray crust forms on the surface. The addition of even so small an amount as 0.50 to 1 per cent aluminum to the melted brass is sufficient to transform instantly the appearance of the surface of the bath. This skin or film, which indicates the presence of aluminum in the mixture appears and remains *still* on the surface of the bath. It is tenuous and sufficiently rubber-like to stop entirely the undesired evaporation of the zinc. This desirable feature is attained only after the agitation caused by the aluminothermic reaction is calmed. If the surface of the aluminum-brass mixture is stirred with a skimmer, and an opening is made in this film, the evaporation and combustion of the zinc start in again around the skimmer, but stop immediately as the alumina film forms. Therefore, it is impossible to see the bare surface of the ternary alloy copper-zinc aluminum at any time, as was also the case with the binary alloy copper-aluminum referred to previously.

Prevents Agitation

ALUMINUM added to other metals and alloys forms a skin or protective coating over the molten metal and prevents oxidation. It also adds fluidity to the metal when pouring. However, unless poured carefully this skin may break and enter into the mold and cause defective castings. This article describes various methods of pouring and includes a new method that is said to give the least agitation in pouring. This article is abstracted from a paper presented at the New York meeting of the American Institute of Mining and Metallurgical Engineers held from Feb. 14 to 17. The author is a consulting metallurgist in Paris, France.

When copper-zinc-aluminum alloys have been cast into ingots they have certain distinguishing characteristics. The surface in contact with the air presents a clean, shiny, golden-yellow color, wrinkled and creased because of the minute foldings which the aluminum film undergoes while cooling. The dull crust, which ordinarily covers brass ingots containing no aluminum, has given way to a perfectly clean and smooth skin like new gilding; here again the phenomenon of shrinkage is noticeably accelerated.

An examination of the alloys of copper and nickel, nickel-bronze, copper-zinc-nickel, or nickel-silver shows the same phenomenon as in the two instances described, with the exception that an addition of aluminum as small as 0.25 to 0.30 per cent generally suffices to cause the appearance of the characteristic film.

In these alloys, as in the brasses, the addition of aluminum suffices to stop the evaporation of the zinc despite the high melting point of nickel-silver. These aluminum alloys in ingot form present a shiny and wrinkled skin instead of the dull, dirty-looking crust that is characteristic of this kind of an alloy when it does not contain aluminum. It is therefore plainly seen that this phenomenon of transformation of the physical properties in the melted state by the addition of small percentages of aluminum is general for commercial alloys of nonferrous metals.

Various inventigations in the metallurgy of iron have established the fact that the phenomenon due to the presence of aluminum takes place also when aluminum is added to ferrous metals.

Small quantities of aluminum added to melting steel calm the bath immediately by suppressing the bubbling to which melting steel is subject. The amount of aluminum added to produce this effect must be small, otherwise the formation of aluminum oxide causes trouble during the tapping operation. Observations show that the addition of about 1 per cent of aluminum to ferrous metals causes the formation on the surface of the bath of an aluminum film having the same characteristics and properties as the film that formed on the molten copper alloys. Therefore, it may be considered proved that the appearance of a tenuous or tough film is an indication of the presence of 1 per cent or more of aluminum in the alloys.

Thus far it has been shown that the alumina film forms constantly and instantaneously on the surface of melted metal containing aluminum which is in contact with the air. It is important to note that this film once formed can never be melted again, and, also, that it never dissolves. If it does seem to disappear during the course of the operations it is only an illusion, and its flakelike particles are merely swimming around beneath the surface of the mass of melted metal.

From the moment aluminum is added to a melted alloy any operation, such as mixing, pouring or transferring from one ladle to another must be made with special precautions to prevent agitation, because this will

Fig. 2—Removing Ingots from the Mold

result in the formation of a more or less thick moss consisting of bits of metal that are caught in the folds of the film wherever it forms. This moss will rise to the surface and appear in the ingot head, and a large amount of it attaches itself either in the neighborhood of the spot where the metal is being poured, and in the molds along the sides of the receptacle, especially in the ingot molds, thus forming spongy zones in the ingots or molded pieces. Because the metallic particles are wrapped in the folds of alumina, as in bags, they remain isolated and never again fuse or solder themselves together.

This phenomenon is the main cause of the large metal losses which have been considered as inevitable in the manufacture of aluminum alloys and especially of the aluminum bronzes. The formation of solid aluminum oxide dross during the solidifying and the shrinkage of the cast pieces has given rise to the bad reputation which has attended the development of aluminum alloys by the melting and casting methods that have been in use for years.

However, these metal losses are not necessarily inevitable because they are due solely to agitating the bath of metal after the addition of aluminum. In order to avoid these undesirable conditions, it is clear that aluminum alloys should not be poured in the same manner as those not containing aluminum.

Ordinary casting operations using strainer gates are not adaptable to aluminum alloys, because they result in a large percentage of waste without obtaining sound products. If a strainer gate is used the metal falls in the ingot molds after passing through a funnel which is drilled with a number of small regular holes. This is the pouring method generally used for casting brass plates, and it presents several advantages. It permits the operator to regulate the flow of the metal by the diameter of the holes, and, therefore, requires no special skill on the part of the molder who has only to keep the funnel full. The speed can be carefully calculated and reduced sufficiently so that as the metal begins to solidify, it feeds itself regularly, as the process of filling continues, thus giving a homogeneous metal and reducing to a minimum the shrinkage of its upper surface if the speed has been calculated well.

It would seem at first glance that this automatically-regulated pouring, which helps to decrease the shrinkage, would be precisely the method required for casting aluminum alloys, where even a small quantity of aluminum greatly increases the shrinkage. But costly experiments have proved that this process is entirely wrong, and it has had to be discontinued, because of the high percentage of dross.

To obtain satisfactory results in pouring and casting aluminum alloys, it became necessary to devise and employ totally different casting methods, and it is toward these methods that research has been directed since the peculiarly valuable properties of aluminum and its alloys have been recognized.

Any kind of an aluminum alloy which is to be transformed into rolled products, or used directly as molded products, must be poured with minimum agitation. This has been accomplished by the new method technically known in France as *coulee tranquille*, that is the *still casting process*.

There are three methods of pouring: Under pressure in metallic molds, namely *die casting;* the tilting process—pouring by tilting; and bottom-pouring or ascendant pouring.

The die casting process is well known in the United States and has given rise to numerous patents. Unfortunately this process is costly. As yet, the still casting process, of which there are two types, is but little known in the United States.

The tilting method of still pouring is characterized by rigid union of the ingot mold and the ladle as shown in Figs. 1 and 2. The melted metal first is poured into the ladle and then cleaned of any dirt which has been produced by this pouring. The mass of melted metal then is transferred to the ingot mold with a minimum of disturbance by tilting the whole system on a vertical plane. This process is patented in Germany and in the United States. It developed in France for pouring aluminum bronzes and now is being introduced into this country.

The tilting has many advantages, but it also presents several disadvantages. It requires costly machinery, double pouring and a certain difficulty in greasing the ingot molds. Moreover, this method cannot be applied to certain delicate alloys. In order to avoid a weakened crystallization during the first solidification of certain alloys which are hot short, they must be poured in such a way as to achieve a structural symmetry in the ingot which is difficult to obtain in the different phases of the tilting. Lastly, it is sometimes difficult to tilt slowly enough to keep the shrinkage at a minimum. These disadvantages are, nevertheless, largely compensated for by reducing the number of skilled laborers needed because, as in the case of die casting, all of the operations of ingot molding can be performed mechanically. Another important compensation is the almost perfect surface of the ingot, and the consequent reduction of waste which has been the bane of the aluminum bronze industry.

Bottom-pouring

The other method of still casting known as bottom-pouring is also patented in the United States, and in Germany, Great Britain and France, as well. By means of certain additions to the mold, this process makes possible the manufacture of castings which are not handled readily by the tilting process.

In bottom-casting the metal is introduced into the mold with a minimum of agitation by means of a gate which is built up to its full height during the pouring operation. At all times it has a short height of fall, which prevents mixing in the dross caused by the wrinkles of alumina film. This method is better for some purpose than the direct pouring with strainer gates, because the pouring may be done slowly, thus reducing shrinkage to a minimum.

Bottom-pouring permits the casting of large size molds as well as ingots and at the same time retains the advantages of greasing the ingot molds. Furthermore, structural symmetry can be obtained when desired, and lastly, the bottom-pouring process can be operated entirely mechanically if necessary. Skilled labor can be eliminated to a large degree in both the tilting and bottom-pouring process.

Explains How To Handle Aluminum Brass

By August M. Roth

At a recent foundrymen's meeting one of the speakers claimed that a curse was placed on the foundry coincident with the introduction of aluminum brass. To a certain extent he was justified in the statement because the metal has been the cause of trouble to foundrymen who failed to study the characteristics. I have handled this metal for the past 15 years in three different foundries, introduced it into one and found it to be one of the most fool-proof metals in the nonferrous group.

It runs easily in the mold and does not require incessant watching on the part of the melter. The molder is relieved of considerable anxiety because he has more leeway in the ramming of the sand and can produce a larger number of castings in a given time. That is the chief goal under modern industrial conditions.

The finest sand may be used and it may be rammed fairly hard without unpleasant results. Liberties may be taken with the moisture content, but of course there is a reasonable limit. No metal that ever was melted can be poured into a mold where the sand is like mud. Light castings must be poured face down and through gates which interrupt the direct force of metal. Castings poured through direct gates are not satisfactory. Heavy castings should be poured from the bottom so that the metal has to climb and thus fill the mold gently. Also for heavy castings it is advisable to cool the metal to a point where it smokes a trifle. Bottom pouring keeps the dross down, especially where lead forms part of the mixture.

Up to 3 per cent lead may be added to castings that have to be machined, while in fancy ornamental castings 1 per cent usually is sufficient. This mixture flows more easily than any other and is in the same class as manganese bronze. Any person familiar with manganese bronze will experience no trouble in handling aluminum brass. This metal is particularly suitable for castings exposed to the weather.

In 1912 I cast a statue weighing 1600 pounds which afterward was set up in a California cemetery close to the ocean. The metal specifications called for 2 per cent aluminum to render the casting impervious to the corroding influence of the salt sea air. Out of a vast number of statues cast during the period I managed this foundry I never have seen one to compare with this one in brilliance. The surface presented a wonderful appearance.

While managing a manganese bronze foundry in 1919 I introduced a metal which soon ran manganese a close second. A large and well known motor boat company had it tested and thereafter specified the new metal for all propellers. The metal simply is an aluminized Muntz metal made up of the usual copper 60 per cent, zinc 40 per cent and with 10 ounces of aluminum added to every 100 pounds of the alloy. From my point of view the introduction of aluminum into the brass foundry has been a blessing instead of a curse. Casting losses in the plant with which I am connected at present never exceed 3 per cent. The average metal loss is between 7 and 10 per cent and where proper account is taken of every feature I do not believe that any foundry can show a better record.

Form New Company

The Titgen-Eastwood Co., Philadelphia, recently has been formed and has procured the patterns and drawings relating to the foundry equipment formerly manufactured by the J. W. Paxson Co. The personnel of the new firm consists of H. W. Titgen, A. B. Eastwood, William Dunbar and C. Gunther who formerly were associated with the Paxson company. The offices and plant will be continued at Luzerne and D streets, Philadelphia.

R. S. Breyman, M. A. Germond, D. Graze, Deane S. Holt and J. C. Yetter have become connected with the sales department of the Harnischfeger Sales Corp., Milwaukee.

How and Why in Brass Founding

By Charles Vickers

Oxides Cause Difficulty

We have experienced some difficulty in casting bushings because after they are machined we find blowholes and inclusions of a greenish-colored dirt which by folding-in causes what looks like cracks. We are using heats composed of 25 pounds of scrap copper wire, 50 pounds of yellow brass scrap, and 25 pounds of scrap red brass. We cast the bushings on end, and we are sending you a sample cut from the bottom end of one to illustrate the difficulty. Do you think the addition of phosphor copper would help us to get the castings clean and sound?

The greenish-colored dirt is oxide and its presence indicates that the alloy is carrying a considerable load of nonmetallic material, possibly admixtures of the oxides of the white metals contained in the alloy. The blowholes of course are caused by gas which is just as likely to be derived from the walls of the mold as anywhere else. When bushings of any considerable length are molded upright, the flask being tightly enclosed on all sides, it becomes a difficult matter for the steam and the hydrogen gas produced by the dissociation of some of the moisture, to escape.

It is the hydrogen that explodes when the vents are lighted and this gas is likely to diffuse into the metal and be held there leaving holes. Therefore, never imprison it in contact with molten brass, but ventilate the mold. If wooden bottom boards are used it is not advisable to perforate them as the gas igniting at the perforations will quickly burn the boards away. There is no sound reason though why perforated aluminum plates cannot be used, and thus furnish a means for the gas to get away immediately. While this may not be the source of the blowholes, it is a matter that deserves consideration. Allied to this imprisonment of the damp sand, is the possibility of its being too fine. For these castings a rather coarse sand is required and a No. 2 Albany or other sand of that grade is none too coarse.

It will be necessary to flux out the oxides during the melting period. This cannot be done by the addition of phosphor copper to the alloy, although it is advisable to add about 1½ ounces of 15 per cent phosphor copper to each hundred pounds of brass. A red brass will not carry much phosphorus. The addition must be small, otherwise the metal will be rendered unhomogenous in structure as shown by fractured surfaces and such metal will not hold even slight pressures. Select one of the fluxes advertised in THE FOUNDRY and use it in melting to clean the brass and then add a small percentage of phosphor copper.

Brass Faucets Split

We have had some trouble with basin cocks and bath faucets. When testing the strength of the shanks, one will split while the other is not harmed. We are unable to understand how it is that with two shanks on the castings, one should be weaker than the other and break. We are sending samples of these castings to illustrate better the difficulty.

The shanks split because the metal is weak due to oxidation. If the machined surfaces of the castings are examined with an ordinary magnifying glass, the pores will be seen easily. Also, it will be possible to note the holes are oxidized on their inner surfaces. A frequent source of such difficulties is melting with high pressure air which aerates the metal and also oxidizes the tin, zinc and lead, either directly or by forming cuprous oxide which later is reduced by the white metals. This aeration and oxidation is responsible for the weakness and porosity, but as the oxides and gases would not be likely to favor one shank of a casting more than another, they are not responsible for the splitting except indirectly.

The source of this discrimination must lie with the gating method. Either one shank is fed more than the other or some of its eutectic is drained away after it has been filled, before the metal sets. For example, basin cocks were cast in upright molds with 8 castings to a mold. The molds were placed above each other in tiers with the shanks down and poured through a vertical runner in the center of the flask. Gates led to the bottom of the nearest shank and the gates branched upward like a tree. They were made this way so the metal would drop first to the bottom of the mold before entering the casting.

It was found that a high percentage of the castings leaked on one shank and rarely elsewhere. An investigation determined the leaky shank to be that to which the gate was attached. This showed that the gated shank acted as a feeder to the other. In the present case something similar is going on in the molds, which connected with the previously mentioned oxidation and aeration produces a line of weakness in one shank, causing it to break easily. This break is a longitudinal split and the drainage is responsible for arranging the oxides in a straight line as a film between the crystals.

In the past few years fuel oil has changed greatly in analysis so that the old burners may not be efficient. Metal when molten is a fluid resembling water and the latter is aerated by air under pressure. The brass furnace contains the same air and all that is needed is pressure to aerate the metal. The action is the same as with water except that the metal is viscid and takes up air easily. So we suggest that the present melting methods be studied and modern methods be substituted if necessary. If the method is faulty, nothing in the way of changing molding sand, gating methods, using deoxidizers or fluxes, etc., will give good, permanent results. It will be always the same old thing, nothing but trouble and losses.

Alloy Does Not Shrink

Can you inform us how to mix and cast nonshrinkable pattern metal?

An alloy known as nonshrinkable pattern metal consists of tin 50 per cent; zinc 50 per cent. To make it the zinc is melted first and the tin added last. If a plumbago crucible is used for melting, the zinc will not melt until the pot has become red hot, after which the metal absorbs heat from the pot and becomes hotter than required, so as quickly as the zinc has melted, pull the pot and add the tin outside the furnace, stir well and pour. The casting part of the operation is exactly the same as for any other metal or alloy. Do not have the alloy hotter than necessary.

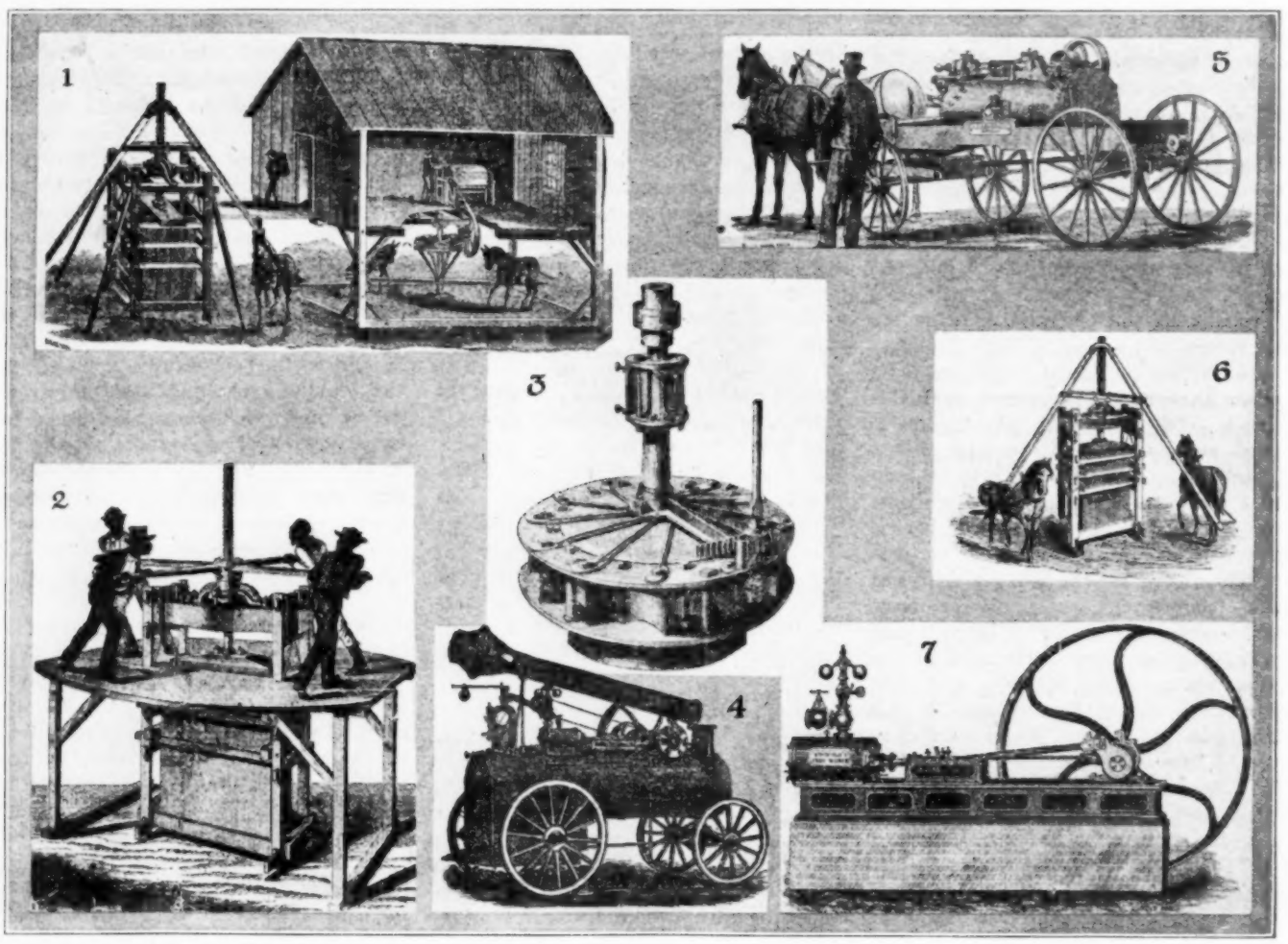
WEATHERS STORMS of 75 Years

Beginning with Three Brothers, the Firm Now Known as J. S. Schofield's Sons Co., Macon, Ga., Has Expanded Until It Operates One of the Largest Plants in the South

ON JUNE 1 this year J. S. Schofield Sons Co., Macon, Ga., celebrated the seventy-fifth anniversary of its existence as a going concern and the twenty-seventh as an incorporated institution under its present name. The original title bestowed by the founder and by which it was known throughout the South for a period of nearly 50 years was the Schofield Iron Works. Beginning in a modest way with three brothers who catered to a local and a limited market, the plant at present employs 300 men and enjoys a market that practically is world wide, particularly in cotton handling and sugar making machinery which has been shipped since 1921 to Cuba, South America, Philippine Island, Hawaii, Mexico and Japan.

Many men, some of them still living, grew up with the institution and never worked elsewhere. Among them are the president John S. Schofield, son of the founder who has been connected with the business for 48 years; George W. Craven of the engineering department who has been with the company for 49 years and old Griff an aged negro who does not know how long he has been there, but who according to contemporary records must have been there at least 55 years. He claims that he helped to build the boiler and plate shop in which he is employed and that formerly he at one time or another worked at every job in the shop, riveter, buckerup, flanger, layout man and assembler.

As at present constituted the shop is fully equipped with modern labor saving devices but Griff in his overalls remains modestly in the background and does all kind of odd jobs by hand in the manner to which he always has been accustomed. He re-



INTERESTING EXAMPLES IN THE EARLY DEVELOPMENT OF STEAM ENGINES, BOILERS, COTTON PRESSES, WATER WHEELS FIG. 1—TWO HORSES TO THE RIGHT ARE OPERATING A COTTON GIN AND ANOTHER PAIR ARE ATTACHED TO THE COMPRESS ALTHOUGH ONLY ONE IS SHOWN. FIG. 2—OLD TYPE HAND PRESS WORKED BY SLAVES. FIG. 3—ONE OF THE EARLY DAVIS WATER WHEELS. FIG. 4—COMBINATION ENGINE AND BOILER WITH HINGED SMOKE STACK. FIG. 5—MACHINERY WAS SHIPPED IN HEAVY WAGONS. FIG. 6—ONE OF THE FIRST HORSE POWER COTTON PRESSES. FIG. 7—EARLY TYPE PLAIN SLIDE VALVE ENGINE USED EXTENSIVELY FOR VARIOUS PURPOSES

marks philosophically. "Whuts de use er goin' off fum home ta wo'k w'en ya kin git all de wo'k ya wants right yeah? Ah reckon Ah'll stay right yeah' till Ah dies."

A bronze tablet on the wall of the main office contains an excellent likeness of the founder of the business and a brief summary of his and its history in the following inscription:

In Memoriam
JOHN SHEPLEY SCHOFIELD
Born, Glossop, England
June 11, 1820
Died, Macon, Georgia
January 21, 1891
Founder
SCHOFIELD'S IRON WORKS
1852
Incorporated
J. S. SCHOFIELD'S SONS CO.
1900

Survival and growth of the business over such a long period of years constitutes what probably is a record in the South where industrial establishments of all kinds were pushed to the limit of endurance or out of the picture altogether during the civil war or in the years of reconstruction which followed. The little shop was 12 years old and doing a nice business when Sherman's men went marching through Georgia swinging the terrible scythe of war and leaving a swath of ruin and destruction behind. Orders are orders and war is war and Sherman summed it all up when he said that war is — well, every person knows what he said it is.

In the years that have elapsed since that time the success of the establishment has been influenced by two other wars in which the United States has participated although both were conducted on foreign soil. The business has persisted through panics, epidemics, depressions, floods, tempests, depreciated currency and the activities of the boll weevil and through them all supplies have been bought, bills have been discounted and machinery and supplies have been sold to an ever widening circle of customers, even if at times payment had to be accepted in the form of produce of the soil.

Some time in 1849 or 1850 the original John Schofield, at that time a clever young mechanic with the inventive bee constantly buzzing in his bonnet, left his home in England and came to America where he trusted fortune would smile upon his efforts. He spent a year or two in New England and then through a combination of circumstances decided to go south and settle in Macon, Ga. Here he secured a job as locomotive engineer on the Central Railroad of Georgia and was so pleased with the work and living conditions that he easily persuaded his brothers Joshua and Robert to join him.

At that time trouble was experienced with the bearings on practically all railroad rolling stock. The engineer's sensibilities were outraged by the inferior quality of the bearings, his inventive mind was attracted to the idea of improving conditions and finally his business sense told him that a profitable market probably awaited a man who solved the problem. With his brothers he established a small shop designed to take care of the metal requirements in the vicinity, with the manufacture of bearings, satisfactory bearings, as a nucleus. In the early days he cast the bearings, finished them and afterward loaded them in a wheelbarrow and delivered them to the customer. A plain, simple mechanic proud of his skill and honesty, but with no silly frills or affectation. He lived to see the business grow to gratifying proportions. His friends and customers increased year by year and he became recognized as a leading figure in his adopted city, but his mental attitude never changed and he remained to the end what is known for want of a better term a man's man.

The first little shop was opened on Hazel and Fifth streets on the site later occupied by the depot of the Macon and Brunswick railroad. In 1855 increasing business prompted a removal to the same block in which the old union passenger depot was located. This plant was extended almost constantly year by year, but by 1900 a decision was reached to erect an entire new plant with adequate room for future expansion. The company was incorporated as J. S. Schofield's Sons Co., and the present plant was erected on a 7-acre site on Boundary street.

An improved type of cotton press was one of the first devices which attracted the inventive and commercial mind of John Schofield. Up to that time the planters had used a large wood screw operated by hand and the process of baling the cotton for shipment was too slow to meet shipping schedules. John Schofield realized that cotton as a staple product of the South was bound to be raised in larger and larger volume as the years went by and the population expanded. His first improvement was to substitute an iron screw for the wood screw then in use. Later he developed an attachment by which horse power replaced the primitive handle bars operated by a number of slaves as shown in one of the accompanying illustrations. The horse driven press was patented in 1867. In 1877 the inventor was granted a patent on the first steam press. The company supplied practically all the presses, horse and steam driven, used in the South during that period.

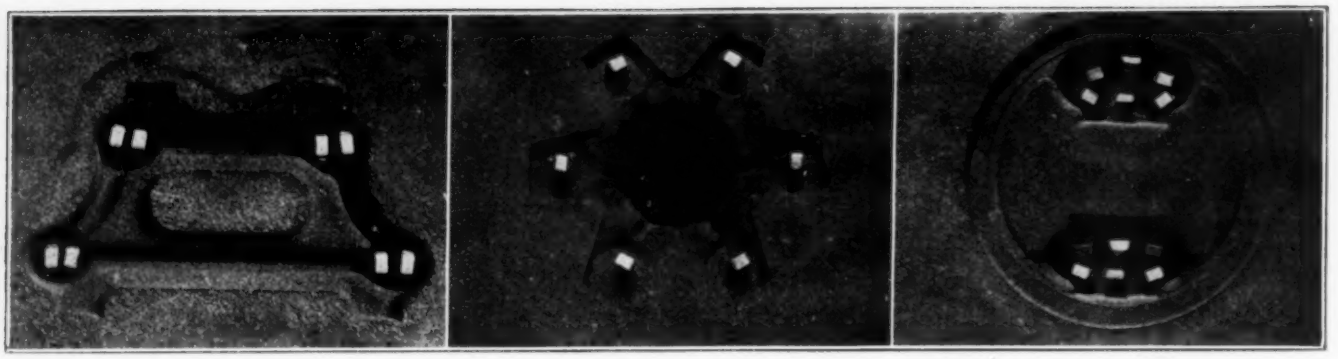
Following the development of the cotton press, attention was given to the machinery required in other industries, sugar, turpentine, lumber, clay and agriculture. Naturally in these before electric days, the steam engine was regarded almost as the universal prime mover. Steam engines in various sizes were built and shipped all through the South. Development of the engine has carried it through many stages from the simple horizontal slide valve type shown in one of the accompanying illustrations, to the highly efficient engine typified by the unit installed in the company's own power house. Water wheels in several sizes were built for customers located in territories where water power was available.

Evolution of bookkeeping methods may be traced through the series of books in which the transactions of the business have been recorded for so many years. The complete set is not in existence, but the ledgers go back to a copy dated 1864—70 and the oldest day book is for the year 1868. This old day book with its yellowed leaves and stamped leather cover contains some fine examples of the ornate and flourishing penmanship characteristic of the period and offers marked contrast to the modern type written card index.

Bookkeeping methods in vogue at present conform to the latest and most improved developments in this branch of administration. An up to the minute cost system introduced by Thomas Perkins a few years ago was described by the author in a paper presented before a convention of the Southern Metal Trades association and was published in The Foundry April 15, 1924. The various shops equipped with everything required in the way of mechanical labor saving devices compare favorably with those in any section of the country.

Receive Appointments

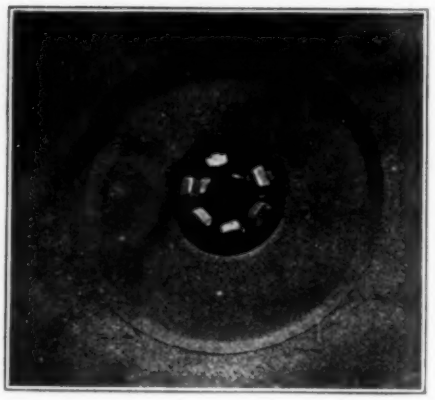
R. P. Shimmin has been appointed assistant to the chairman and president of the Link-Belt Co., Chicago and will make his headquarters at 910 South Michigan avenue, Chicago. Frank B. Caldwell has been appointed sales manager of the firm with headquarters at the 39th street plant and will have supervision of all sales activities in the western division.



Prevent Flaws in Steel Castings

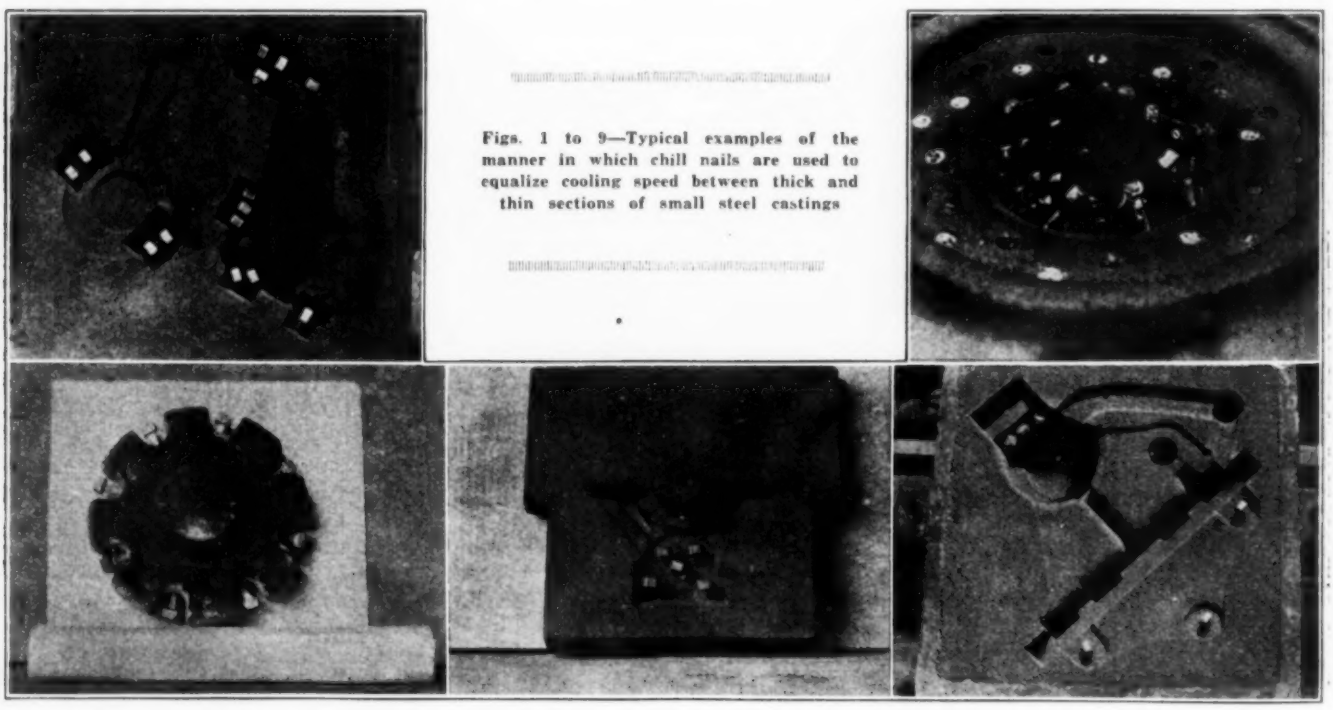
By James L. Gibney

CAVITIES may exist in steel castings and never appear until the casting fails under severe load or test. This applies even to castings that have been machined on the surface and subjected to rigid inspection, but does not necessarily imply that all steel castings carry inward defects. Usually the factor of safety incorporated in the design of the casting is sufficient to counteract any tendency toward failure under load even though the casting may contain a hidden crack or shrinkage cavity.

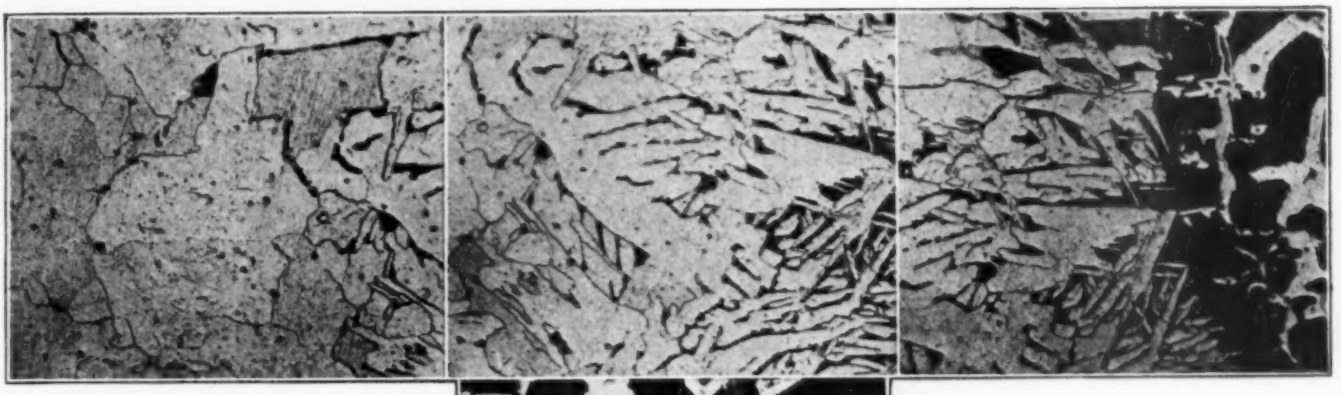


Steel foundrymen without exception bend every effort toward prevention of flaws whether exposed or concealed. Internal chilling of the metal by the use of large head nails is practiced extensively at those points in the casting where the foundryman's judgment and experience lead him to expect a defective area. Variation in freezing time between thick and thin sections is responsible for the majority of scrap castings. Volume of electric steel castings has increased to a marked extent year by year for the past 15 years. Exceedingly high temperature at which this metal is melted and poured has increased the tendency toward shrinkage cavities and contraction strains. The comparatively long cooling period promotes the formation of cavities in heavy sections of a casting, bosses, lugs, or parts situated where they cannot be fed properly from the risers. Within the past few years the *X*-ray apparatus has provided foundrymen with a method for studying concealed cavities hitherto out of range unless the casting was sawed into sections.

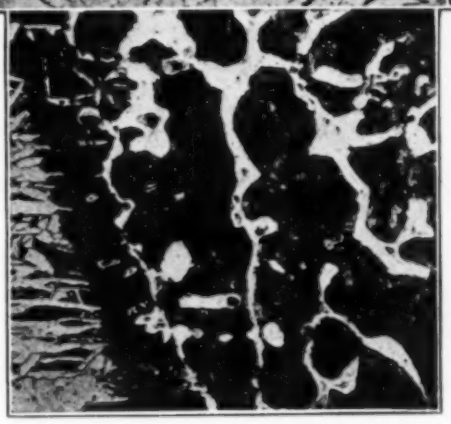
In the writer's opinion the introduction of nails similar to those shown in Fig. 17 affords the most



Figs. 1 to 9—Typical examples of the manner in which chill nails are used to equalize cooling speed between thick and thin sections of small steel castings



Figs. 10, 11, 12 above and 13 right—Micrographs at 100 magnifications which show the perfect union of the nail with the surrounding steel. Fig. 10—Low carbon-free ferrite grains in the nail. Figs. 11 and 12—Show migration of carbon from the steel into the nail. Fig. 13 Below—Shows perfect fusion. Black areas are pearlitic with free ferrite in the grain boundaries in the steel casting



satisfactory solution to the problem. The point and part of the stem are buried in the sand face of the mold, leaving the remainder of the stem and the large head exposed in the mold cavity as shown in several of the accompanying illustrations, Figs. 1 to 9. Local conditions govern the number, size and position of the nails required for any given casting.

Hot, fluid metal entering the mold amalgamates perfectly with the nails. Subsequent shrinkage and accompanying compression of the steel insures a perfect union. Identity of the nail is lost. A steel foundryman accustomed to the use of nails and familiar with their possibilities practically can guarantee the solidity of the metal in any part of a casting where they are used. After the casting is ground and chipped no evidence of their presence remains.

Rate of solidification in steel castings is determined by the pouring temperature, character of the mold, dry sand, green sand or chilled and the general size and shape of the casting. Regulation of the correct pouring temperature is an important factor in controlling the tendency to shrink or crack.

Great bulk of steel castings, particularly castings made in electric steel foundries range in weight between ¼ and 40 pounds. Metal must be poured at an exceedingly high temperature to run these light and usually intricate castings. Steel in this condition intensifies the already severe contraction strain incident to the junction of light and heavy sections. Judicious application of the chill nails reduces the strain by equalizing the cooling rate of both bodies of metal. Also in many cases the sink heads may be reduced in size or omitted altogether.

Through ignorance on the part of the designer of a steel casting, the foundryman sometimes is given a pattern from which it is practically impossible to produce a sound homogeneous casting under ordinary conditions. The shape may preclude the possibility of using risers to advantage. Chill nails are particularly efficacious in instances of this kind. Also in core pockets as shown in the two examples illustrated in Figs. 6 and 7.

Experienced foundrymen familiar with the phenomena of shrinkage and contraction in steel castings have adopted many devices and expedients to prevent the castings from cracking. Usually they are shaken out immediately after the metal has set, but the contraction is so sudden and so severe that this preventive measure is not always satisfactory. Various chilling methods are practiced. Surface or external chills, cast iron bodies of various shapes are placed on those parts of the pattern where a chilling effect is desired in the casting. These chills do not unite with the casting. They form part of the mold and may be used repeatedly. Their function is to conduct the heat away rapidly from that portion of the casting with which they come in contact. Surface chilling is effective in some instances, but it lacks many of the advantages of internal chilling. Surface chills are expensive and always remain as a fixed charge. Internal chills in the form of nails become amalgamated with the casting and are sold to the customer at

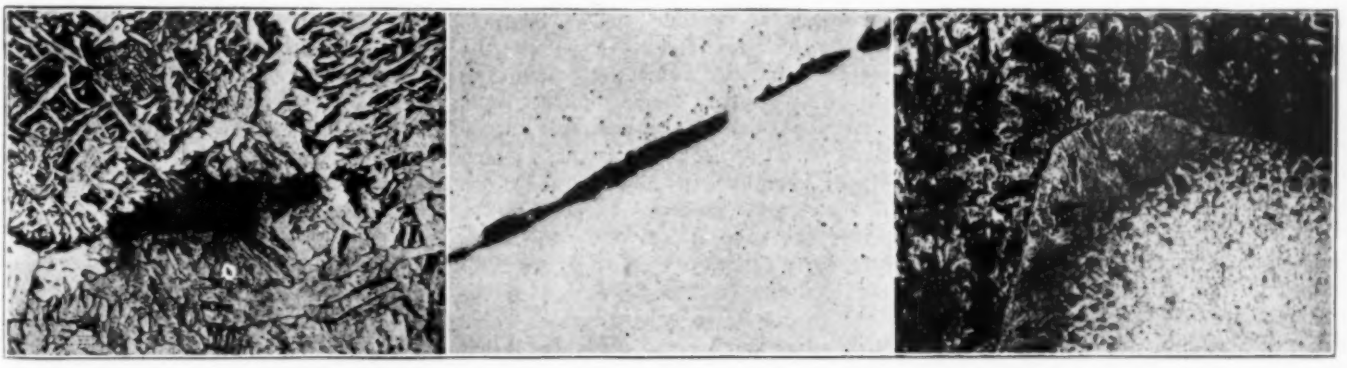


FIG. 14—THIS AND THE ACCOMPANYING MICROGRAPH FIG. 15 SHOW THE EFFECT OF EMPLOYING RUSTY NAILS. AN OXIDE FORMATION PREVENTS FUSION OF THE METAL WITH THE NAIL. THE SAMPLE SHOWN IN FIG. 14 WAS ETCHED, THE OTHER WAS UNETCHED. FIG. 16—NOTE CARBON MIGRATION AND PERFECT FUSION BETWEEN NAIL AND STEEL IN THIS CASTING POURED UNDER PROPER CONDITIONS

the price quoted for the castings.

One prominent maker of crankshafts places lengths of cold rolled shafting in his crankshaft molds, in the shaft part proper and also in the throws. He requires less molten metal to fill the molds and he is sure the castings will be solid in all parts. Elimination of risers to a great extent yields a greater tonnage of finished castings per ton of metal melted.

In some instances large flat head nails are employed to chill certain parts of small castings. Their usual function is to strengthen the face of the mold and thus prevent the sand from cutting or scabbing. As chillers their effect is almost negligible and they cannot compare with independent outside or inside chillers.

A combination of inside and outside chills forms an ideal arrangement. Obviously better castings are produced when the cooling process starts simultaneously on the inside and the outside. Particularly with small castings, contraction stresses are lessened and the castings are free from cracks or cavities. Introduction of the nails promotes a uniform rather than a selective shrinkage action.

Illustration of how steel freezes under three typical conditions is shown at *A*, *B* and *C* Fig. 19. Where no provision is made for feeding the casting and where gradual freezing starts simultaneously on all sides of the cube, the result will be a cavity in the center as shown at *A*. The center figure *B* shows the usual method adopted of placing a shrink head over the casting. Shrinkage of the casting draws metal by gravity from the feeder. The final result is a solid casting with a particular cavity in the riser where it does no harm.

Manner in which chill nails are placed in the mold for an automobile hub casting is shown at *C* in the same illustration. It is apparent that freezing starts simultaneously at two points. Crystals are deposited against all the walls of the mold, also around the nails. The growing bodies gradually meet and produce a casting free from cavities or other defects.

Chill nails, of course will not supplant risers altogether. In certain instances they may, as already intimated, but in the majority of cases they are employed rather in a secondary capacity or as a supplement to the risers. The combination usually furnishes a solution to many troublesome features. The riser effects pressure on the freezing casting and this pressure helps the fusion of the metal around the nail.

Correct application of the nails effects a saving in the amount of metal required in the risers. Small castings command better prices than larger castings and small savings constitute an appreciable factor on many small orders. Risers only represent scrap value while every pound of metal saved in the furnace represents reduced operating cost.

Twenty-four nails at a cost of 6 cents will save one pound of metal. Cleaning and finishing costs, cutting gas and labor, are reduced on account of the smaller number and size of the risers. Good steel foundry practice does not favor cutting down too much on the feeding heads, but in many instances, particularly in small castings they may be reduced or even omitted where chill nails are employed.

Use of nails must be tempered by discretion. For example where a considerable number are placed in one mold, the temperature of the metal must be exceedingly high to insure a proper fusion of the nails with the steel in the casting. These nails are of a composition which blends readily with the ordinary run of low and medium carbon steels. After the casting is poured the nails lose their identity. The only remaining evidence of their presence is the part projecting on the outside. This disappears during the cleaning operation.

Interesting example of this feature is shown in Figs. 10, 11, 12 and 13, reproductions of micrographs at 100 magnifications of the perfect union of nails with steel in a medium carbon casting where proper working conditions were observed. Views were taken at four different parts of the joint zone to show structure of nail and adjoining metal. Fig. 10 shows low carbon free ferrite grains in the nail, grains overheated by high casting temperature but restored to normal after annealing. Micrographs 11 and 12 show two different sections of the same specimen near the point of fusion. Migration of carbon from the casting into the nail may be noted. Perfect fusion between nail and casting is shown in Fig. 13. Black areas are pearlitic with free ferrite in the grain boundaries of the steel casting.

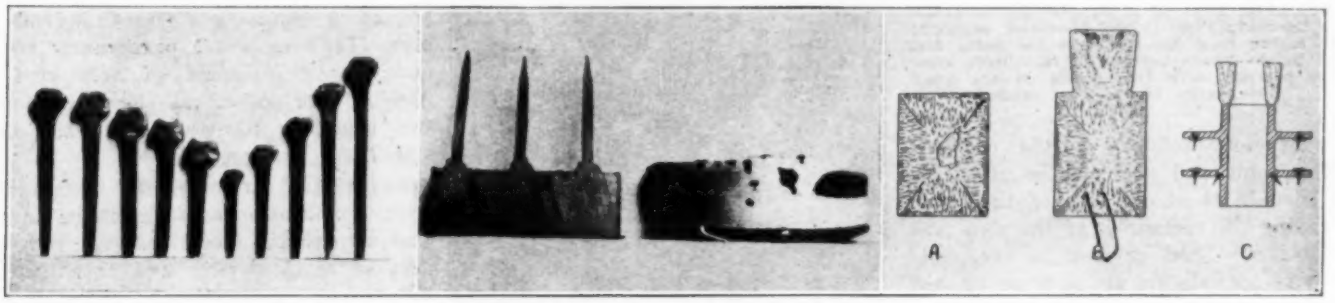


FIG. 17—CHILL NAILS FOR STEEL CASTINGS. FIG. 18—SHOWING RESULT OF USING CLEAN NAILS (LEFT) AND RUSTY NAILS (RIGHT). FIG. 19—HOW STEEL FREEZES UNDER THREE TYPICAL CONDITIONS

Nails must be free from rust to insure proper fusion. Typical blowhole structure from the use of a rusty nail is shown to the right in Fig. 18. A molder would not attempt to skim a ladle with a rusty iron or a damp shovel, but occasionally he overlooks the fact that the explosion incident to the introduction of rust or dampness into a ladle of metal is reproduced, on a smaller scale it is true, but just as infallibly in a mold or any other place where molten metal is brought into contact with either or both of these items.

Examples of oxide formation due to rusty nails and which prevented perfect fusion are shown in Figs. 14 and 15. In Fig. 14 the upper section represents the nail while the lower part below the oxide line is the steel. In Fig. 15 this condition is reversed. The lower structure shows the nail with the steel shown in the upper part. Polished steel nails are available for this kind of work and present an insurance against rust.

Hot metal around the nails is essential and occasionally it may be necessary to change the customary location of the gate to bring the hottest metal from the runner directly into contact with the nails and thus effect a proper fusion between the two.

Many steel foundrymen favor the practice of placing small knobs or buttons on the face of the pattern at the points where nails are to be inserted in the sand. These projections serve a double purpose. They remind the molder that nails are required and they indicate definitely where to place them. Also when the lump is removed later by chipping or grinding a more perfect joint is assured around the stem of the nail.

Due to the variations of temperature in foundry atmosphere, nails easily pick up moisture and become rusty. They should be stored in a dry warm place and only given out on requisition. Nails that are not used should not be left on the molding floors or elsewhere over night where they are exposed to dampness. They should be collected and returned to the stock room.

Reports from many sources indicate that chill nails are used extensively both in green sand and dry sand molds. Nails in green sand molds allowed to stand over night are bound to collect moisture, especially if the sand was rammed while warm. Dry sand molds and cores with inserted nails, exhale steam during the drying process and in the morning the nails although dry are covered with a red oxide. In some instances this thin film of oxide has not proved dangerous, but in every instance tested the casting was not as perfect as similar castings in which clean polished nails were employed. Various protective coatings have been applied particularly to nails that are placed in dry sand molds. Copper plating is highly satisfactory but the cost of plating in some instances is a prohibitory factor. A weak copper chloride dip is comparatively inexpensive and in the writer's experience has answered the purpose for which it was intended in a perfectly satisfactory manner. Skin dried molds give little or no trouble. Usually they are poured before the moisture has time to condense on the nails.

Many patterns sent into steel foundries are entirely unsuited for the production of solid castings. Variation in thickness sections taxes the foundryman's skill to the limit. Insertion of chill nails at some of the junctions between sections of various thicknesses of metal has proved a distinct aid in preventing cracks, draws and cavities. A mold for a typical casting with a natural tendency to shrinkage trouble is shown in Fig. 8. Risers cannot be placed to advantage on this casting, therefore internal chills are applied to advantage.

Gear wheel castings whether cast as blanks or with teeth, show a tendency toward cracking at the junction of the rim with the arms. On account of the difference in thickness between the rim and the arms, the arms solidify first and pull away from the rim. Chill nails at the junction usually effect a cure.

Use of chill nails is not confined to the steel foundry but in iron foundries their use should be confined to castings with fairly heavy sections. A hard area will be formed in the vicinity of any nail placed in a thin casting. Quick change of temperature in an iron casting affects the carbon content to a marked degree. This feature has to be watched carefully.

Illustration of a micrograph Fig. 16 shows the nail and iron structure in a 10-pound casting of an analysis to permit easy machining. A more hasty cooling in a thinner casting would have resulted in a skin of combined carbon in cementite form. The slower cooling precipitated the carbon in the graphitic condition and the result is a metal readily machinable.

Contraction of Casting Causes Trouble

Question: I ordered two cast iron tables 6 feet square, 6 inches thick, flat on one side and with 4-inch square rib all around the rim of the top on the other side. The casting was to have 61 holes each 3-inch diameter and equally spaced with five rows 8 holes to a row and with 3 rows with 7 holes to a row. I had the castings made in two foundries whose proprietors assured me they could make the castings with the holes accurate to 1/64-inch. A full pattern was supplied with prints 3 inches long on the face side. A full corebox also was furnished to make cores designed to just touch the cope side of the mold. When the castings were made I refused to accept them. The size of the holes varied ⅛-inch and the holes were not in line. The foundrymen then claimed that it is a physical impossibility to secure the desired accuracy. Contraction of the casting distorts the cores and also shifts their relative position. What is your opinion?

Answer: It seems rather odd to us that any practical foundryman should promise such a large, heavy casting within the limits specified. Unless the castings were made in a metal mold he could not even guarantee them to weigh alike within 100 pounds. If the foundryman supplied the pattern and corebox, clearly he is to blame for promising something outside his power to perform. If he accepted the customer's pattern and corebox and then exercised all due care and diligence, clearly then the fault lies with the customer in not providing a pattern that would anticipate contraction features in the casting. Probably a contributory share of the blame in this case also may be placed on the foundryman for neglecting to check the dimensions and assuring himself that the pattern and corebox were satisfactory.

The 3-inch corebox should have been made at least 1/16-inch over size to provide for the inevitable compression of the core when subjected to the heat and pressure of a slab of molten iron 6 inches thick. Core prints should have been provided on the cope side even if only approximate accuracy of position was desired. However, the most important feature which probably was overlooked was the spacing of the core prints. A casting 6 feet square and with nothing to prevent, will contract ¾-inch in length and width. All the contraction will lead to the center, therefore in laying out the holes provision must be made for the fact that the outer row of holes in the casting will be ⅜-inch nearer the center than they were on the pattern. The inside or center row will not have changed position, but every row in between will have moved a proportional distance between nothing and ⅜-inch. From the foregoing it is apparent that the job of laying out the holes is a much more complicated proposition than appears on the surface. Instead of a uniform distance between the core prints as decided by a standard shrink rule, the space between each pair will have to be determined individually. Even if any person were to go to the trouble of working out such a complicated problem, a variation from the anticipated contraction of the metal would throw the holes out of line again. A tolerance of 1/64-inch is out of the question.

Opens District Offices

Western Iron & Foundry Co., Wichita, Kans., has opened a district office at Tulsa, Okla., in charge of L. N. Sunberg and at Amarillo, Texas in charge of C. F. Kimbrough.

A gain of 12.2 per cent in iron and steel castings exported from the United States was reported for 1926. In 1926 the amount was 36,743,000 pounds while in 1925 it was 32,752,000 pounds.

Bill Describes Making of Mine Car Wheels

By Pat Dwyer

USUALLY after the family retires for the night I sit up for half an hour or more to smoke the pipe of peace, indulge in a little quiet meditation, chew the mental cud after the manner of a placid and ruminative old cow, let my mind wander in straight lines or circles without let or hindrance until the spring finally runs down. When I arrive at this blissful stage, my mind a perfect blank and my eyes half shut, I drag the old weary frame upstairs, creep into bed ready and willing to fall promptly to sleep.

I cannot say if sleepnessness is a general characteristic of feminine humanity or whether it is a gift in this particular instance. The proverbial mouse could learn a thing or two from watching me glide up the stairs, shedding the garments and oozing in between the sheets and yet, before I have taken the first long breath preparatory to sinking into unconsciousness, I hear a voice from the darkness inquiring if I have locked the door and shut off the lights downstairs. On sundry and divers occasions, not at night of course, but in broad daylight when presumably I have been wide awake and in full possession of all my faculties, I have pointed out to the lady the utter futility of locking the front door. Burglars may have their faults like any other class of people, but also it is well to remember that they have devoted several years to perfecting themselves in their chosen profession. Probably they are as deeply chagrined as any other artist or professional man when their plans miscarry. Failure to carry a job to a successful conclusion not only exposes one of these gentlemen to the gibes of fellow artists, but it represents wasted time, a decided drop in the curve of his earning capacity.

Then, there is the little woman and the kiddies to consider. They depend absolutely on the good man for all creature comforts, food, clothing, shelter, all the etceteras enjoyed by the family next door, besides the upkeep of a smart coupe, a substantial family car and the lightning bug employed by the honest artizan himself in the pursuit of his professional duties.

Taking all these points into consideration, it is only natural to assume that a burglar compiles his prospect list as carefully, or even more carefully, than his first cousins who sell real estate, gilt edged securities, tips on the races, or wildcat oil and mining stock. On this basis our humble little cot would not attract the attention even of an amateur. As a clincher I quote my experience last summer when I was home alone for a month. I never locked the door and never had a visitor.

To my mind that line of argument built solidly on cold, pitiless logic should convince even the members of the ordinary, average, hopeless jury who openly admit that they read the papers, but form no opinions. Their minds are virgin fields in which the seed sown by the more skillful of the two opposing advocates will sprout luxuriously. To any intelligent person I felt that the arguments I advanced should prove incontrovertible.

The lady brushes the arguments aside with the remark that they are nothing but the purest kind of drivel. Since I seem to be so well acquainted with the mental processes and technique of the burgling profession she wonders why I don't join the ranks, and give her additional cause for worry. Furthermore, when she leaves again for the summer she will lock the door, take the key with her and farm me out with some reliable family who knows enough to lock its doors. Also, she will appreciate a postal card occasionally advising if I have been lost, strayed or stolen. On second thought she will omit the stolen item. Conceivably, I might become lost or strayed, but she is reasonably sure no person will steal me. If I wish to prolong the argument I retort that she need not feel so sure. The papers every day are filled with stories of apparently insignificant men who have been stolen by predatory females. She laughs at this gloomy prophecy and dismisses it carelessly with the well known proofreader's term *Stet!* The argument usually, in fact I might say invariably, ends in a draw, honors even, both parties still on their feet, but with no decision and with all bets declared off. The

WITNESS EXPERIENCES A FEW TENSE MOMENTS

foregoing, as Bill says is daylight stuff. At night the procedure is slightly different. As I said in the beginning, some eight or ten or maybe a dozen paragraphs back—I am not going to count 'em now, count them yourself if you want to, but don't bother telegraphing me the result, collect—as I said in the beginning, just as I am sinking into oblivion, arms of Morpheus, natures balmy sleep and all that jolly old what-do-you-call-'em, a voice asks me if I have locked the door.

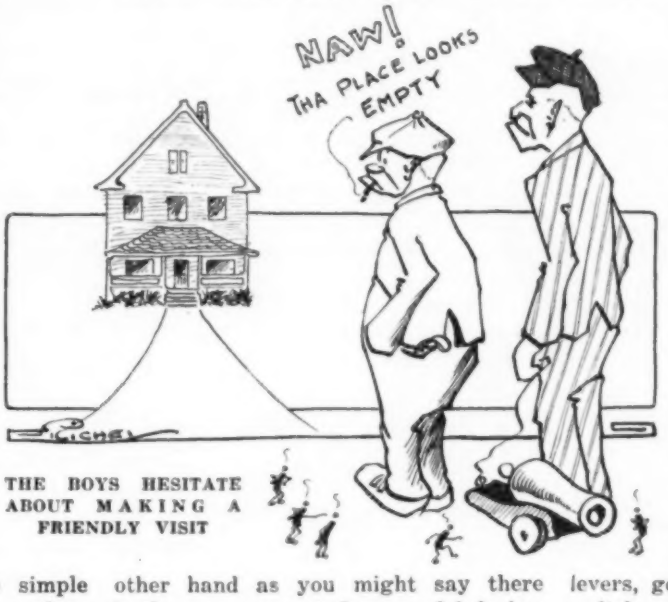
Dashed impertinent kind of a question, I think, any way you want to look at it. A wife should repose more confidence in her protector. It is not a fair deal. As our English cousins say it is not cricket. I never ask her if she has locked the door, on the rare occasions she comes in late. Perhaps one reason may be that on these occasions invariably I am asleep. On some of these occasions I answer, "yes," boldly and in a loud voice. A man of few words, I see no reason for entering into any further explanation. When I go to bed I go there with the simple intention of going to sleep and not for the purpose of telling bedtime stories or of supplying answers to test questions. I hear enough questions all day, besides the shower of home work questions with which I am bombarded at night. Surely a man is entitled to a few hours sleep.

The answer, "yes," should be sufficient, but is it?

I regret to say that apparently it is not. I am asked suspiciously if I am sure, and when I still persist in my original statement I am asked whether I locked the door immediately before I came to bed or at some time previously. How is a man to remember details of that kind? She might just as well ask me what I had for breakfast June 13, 1911. Basing my opinion on circumstantial evidence, life time habit and one thing and another I am willing to take affidavit I had breakfast on that day, but certainly I should find myself up salt creek without a paddle if I had to swear to the menu. I believe in answering reasonable questions, but surely there is a limit.

By this time all thought of sleep has vanished and I find myself confronted with the choice of two alternatives. I might adopt the stern cave man attitude and stop the flow of questions by tapping her on the head with the alarm clock or the leg of a chair—not too hard, you understand, but sufficient to rock her to sleep temporarily—or, I might go down stairs, try the door and if necessary, lock it.

A weaker man probably would toy with these two alternatives indefinitely in a vain endeavor to come to a decision. The tapping process presents certain advantages, but then on the other hand as you might say there is the ever present danger of injuring the clock or the chair. A three legged chair is an abomination and an alarm clock with the bows stove in, never is the same again. It is bound to be unreliable and I can conceive of nothing more conducive to spoiling one's morning sleep than an unreliable alarm clock.



THE BOYS HESITATE ABOUT MAKING A FRIENDLY VISIT

The gambling instinct inherent in most men, the temptation to take a chance almost prevails sometimes to adopt the first of the two alternatives, but up to the present I am happy to say I have succeeded manfully in resisting temptation. Habits of a life time, passive or otherwise are not broken easily and since I never have bumped a lady over the head with any form of lethal weapon, I rather hesitate at establishing a precedent. Also the possibility exists that in my ignorance of the proper technique I might slip and find myself playing the unfortunate role of the bumpee instead of the bumper. I still claim that I am within my constitutional rights and that I have done my full duty when I answer, "yes," but just to heap coals of fire on the lady's head I go down stairs, lock the door and then come back to tell her it was locked all the time. She says yes, she heard me while I was locking it.

Once more back in bed I spend the interval until sleep overtakes me in revolving various plans for solving the problem. Unfortunately before the details of any plan are worked out satisfactorily my mind seems to lose its grip. Mental images become vague and intangible. Then the vista opens out and I find myself in some places with which I am familiar and in other places I never have seen. I associate with people whom I meet every day and with others I have not met for periods of years ranging back to the time I wore a little kilted petticoat and a Glengarry bonnet with two streamers at the back. Once again I enjoy the company of those whose passing has caused my heart to contract in anguish and sometimes I bump into lads I have not seen for years but the news of whose passing I should be inclined to greet with three rousing cheers. Then as our movie friends say, comes the dawn. A whole night wasted and the problem still unsolved. At odd times in my waking moments I have contemplated the installation of a mechanical, magnetic device of levers, gears and bolts with a control switch at the head of the bed and with a red and green light to indicate whether the lock was opened or closed. The other day I submitted a tentative sketch of the thing to Bill—necessarily a rough outline since I had not worked out the details—and asked his opinion.

"Well," said Bill, "I'll tell you. To be perfectly frank, man to man and so forth, I never saw any other person who could spend so much time fiddling around and getting nothing done. You have a spring lock on that door. Why don't you release the catch some time during the evening? If you are too lazy, delegate some member of the family to do the dirty work. Then when the door is closed, it is locked. Electrical contacts, levers and bolts, hickeys, doodads and gadgets, forsooth! It is a wonder to me the missus long since has not wrapped a ball and chain around your feet to keep you on the ground."

"That spring lock thing," I admitted, "is a noble idea. Please accept the keys of our fair city. Perhaps you can tell me something else. I had an inquiry the other day from a man who wanted to know how mine car wheels are made, particularly some information about the chills."

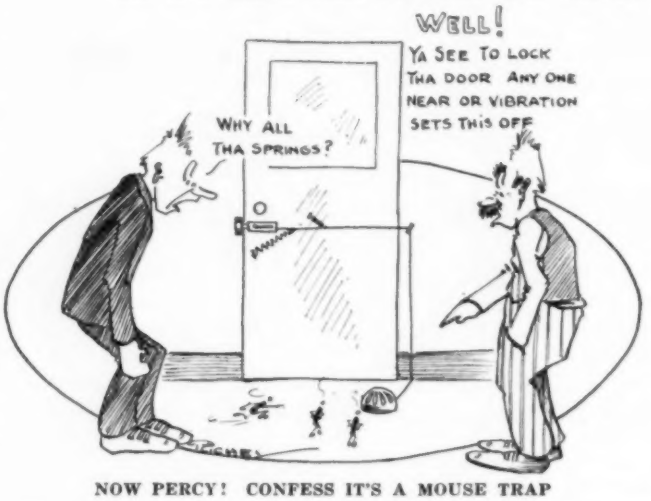
"That's a kind of a double barrel question," said Bill, "and the second part is rather indefinite. From the inquiry it is impossible to determine whether information is wanted on the scientific principles involved in producing a casting with one part gray and another part white, or, if information is required on the construction and application of the cast iron ring in which the wheel is cast and which is known as a chill. For convenience I shall assume your correspondent is thinking of making some chills and only is interested in the physical features.

"Mine car wheels are not made in anything like the quantity which characterizes the standard freight car wheels, therefore manufacturing methods have not been standardized to the same extent or advanced to the same degree of perfection. To a great extent it is a localized industry and manufacturers practically are free to establish their own standards for any given territory. For the same reason the relative size and thickness of the chills will be found to vary in different localities. Where ideal coke and iron are available a chill 2 inches thick might give maximum service. In another place where that kind of coke and iron only could be had by importing at high freight rates, the foundryman might find it advisable to use a local iron of an inferior quality for that particular purpose, but which would serve by increasing the thickness of the chill. This is a point which only can be settled satisfactorily in any given locality by experiment.

"Standard car wheel chills are provided with lugs and trunnions, the former for the accommodation of the cope and drag and the latter for handling by the crane. Small wheels are made without crane service, therefore the chills require no trunnions. The chills are rammed inside square or round drags, therefore they require no lugs. In other words the chills employed on small wheels, simply are plain rings approximately 2 inches thick, the same depth as the wheel pattern and machined on the inside to fit loosely on the wheel pattern from a point halfway on the flange to the bottom of the tread.

"Although not confined exclusively to the subject of chills the following reference to small wheels may be of interest and service to the inquirer. Mine car wheels or any other kind of chilled wheels present many interesting features and considerable practical experience is required on the part of the foundryman who attempts to produce them at a profit and in a manner that will meet the rather severe specifications of the customer. The actual molding equipment and operations do not differ materially from those employed in the making of any castings of an approximately similar shape and size in green sand molds.

"The tricky feature in making these castings is to control the analysis of the iron within close limits so that on the one hand the wheels will not crack and on the other hand they will show the required depth of chill in the rim while the center is soft enough to permit machining at a reasonable speed. The tread of the wheel is not touched with a machine tool, but the hub must be bored and fitted to an axle. Some wheels are pressed on, but the majority revolve on their axles and are provided with pockets or chambers in the hub to hold lubricating oil or grease. In some instances the design is simple, while in others an intricate chamber core in the hub causes the foundryman unnecessary trouble and expense.



NOW PERCY! CONFESS IT'S A MOUSE TRAP

"Many methods are available for making the molds. The best method to adopt will depend on local conditions including the extent of the orders. Manufacturers of molding machines have developed special types for handling these molds and you can secure all necessary information, type, capacity, method of operation and prices by writing to the firms whose names you will find in the advertising pages of THE FOUNDRY.

"Where the number required is small and where no molding machine is available on which the patterns may be mounted as a part time job, the molds are made by hand in small flasks on the floor. The equipment includes a pattern, rollover board, drag, cope, chill, and one or two coreboxes depending on whether the hub and chamber core are made as a unit or as two separate cores. In some instances, a third corebox is employed to make a covering core for the hub. This core contains several small openings that serve as gates for the metal poured into a basin above them. In other instances a single, plain, small, round pin is employed to form a single pop gate on top of the hub. One noticeable point of difference between the methods employed in making small wheels, and those used in making the regular standard freight car wheels is that the small wheels are cast with the flange in the upper part of the mold. The pattern is placed with the flange resting on the rollover board and a ring chill approximately 2 inches in thickness and slightly less in width than the tread of the wheel is placed around it. The drag which is slightly larger than the chill and a few inches deeper is rammed full of sand and rolled over. The cope is rammed on top of the drag and lifted off. The pattern is removed from the drag, the center core is placed in position and the mold is closed and poured. When not in use the chills are kept in a dry place and usually are wiped with a handfull of oily waste, or waste that has been dipped into a mixture of oil and plumbago, before they are placed around the pattern. Any material that will keep the face of the chill dry will serve.

"Where conditions seem to warrant, it may be advisable to prepare two pattern plates, one for the cope and one for the drag. Then two men could be employed advantageously. In slack periods one man could use the same equipment to advantage. An interesting description of an ingenious device for molding mine car wheels was published in the Sept. 15, 1923 issue of THE FOUNDRY.

"To secure a good wearing chill on mine car wheels, also to prevent the wheels from cracking, they are made from an iron mixture that will yield the following approximate analysis: Silicon 0.70; sulphur 0.05 per cent, phosphorus 0.30 per cent, manganese 0.60 per cent. The red hot wheels are taken from the molds and placed either in a pit in the floor or in a steel container and allowed to anneal for two days."

Adapts Wood Turning Methods to Pattern Shop Production

By Walter C. Ewalt

VARIOUS methods employed in turning wood often prove exceedingly useful in making patterns. While it may be possible to make a pattern by any one of several methods, usually a careful study will show that one particular method is adapted better to the job than any of the others. Although this article illustrates primarily methods of turning wood, the discussion may bring out reasons for adapting certain methods in the manufacture of particular patterns.

The pattern illustrated in Fig. 1, which has one part similar to a rectangular block and the other a semicircular piece, is made up of eight pieces glued together. With the exception of the fillets and the rectangular part, which is finished by hand, the patterns is turned on the lathe. Four pieces, large enough to make the semicircular portion, are fastened together and centered on the face plate. The four pieces must be fitted carefully and care must be taken to place them on the face plate as shown in Fig. 2. A template, shown in Fig. 1, is made to fit the curve desired on the face of the pattern and the blocks are turned. The blocks then are removed from the face plate and glued together in the position shown in Fig. 3. This operation completes the portion of the pattern shown at the left of the center line in Fig. 1. The same operations are employed to produce the portion of the pattern shown at the right of the center line in Fig. 1. The steps are shown in Figs. 4 and 5. After this portion of the pattern is assembled, the two halves are glued together at the center line.

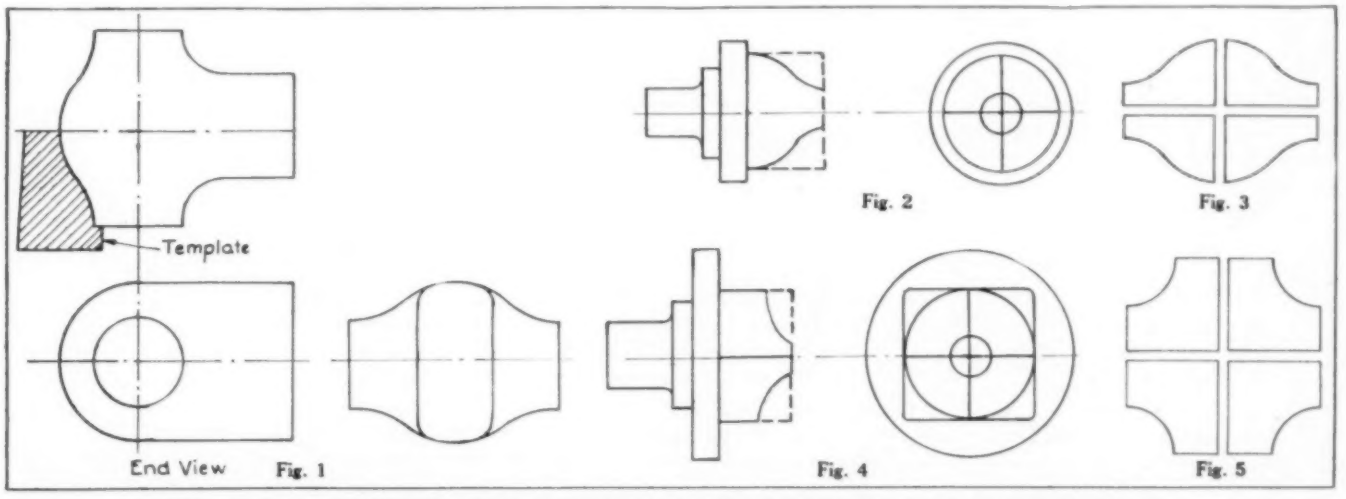
A question may arise concerning the reasons for making this pattern from eight pieces rather than from four, or two to each half. Although the use of eight pieces was discussed chiefly to illustrate one method of procedure in the manufacture of a pattern, consideration of the advisability of using this method for the pattern under discussion may prove interesting.

If each half of the pattern is made of two pieces, the two pieces *A* and *B* may be joined together as shown in Fig. 6. When made in this manner, the portion shown at *A* first is turned in full. The portion *B* then is made and extends to the center of the ball as shown. This method requires that some wood be cut either from *A* or *B* and the portion cut away probably is wasted. The portion wasted will not amount to much in small patterns but in large patterns will increase the cost materially. In the method illustrated in Figs. 1 to 5, no lumber is wasted at the joint. When a solid pattern is necessary, the angled joint, shown in Fig. 6, probably is best and the pattern should be made in that manner. When the pattern is large and a laminated or segmental pattern is desired, the method shown in Figs. 1 to 5 probably will be more satisfactory. However, as previously stated, this discussion has been prepared chiefly to illustrate methods of wood turning which may be used in the pattern shop rather than to outline the proper method of procedure in making a particular pattern.

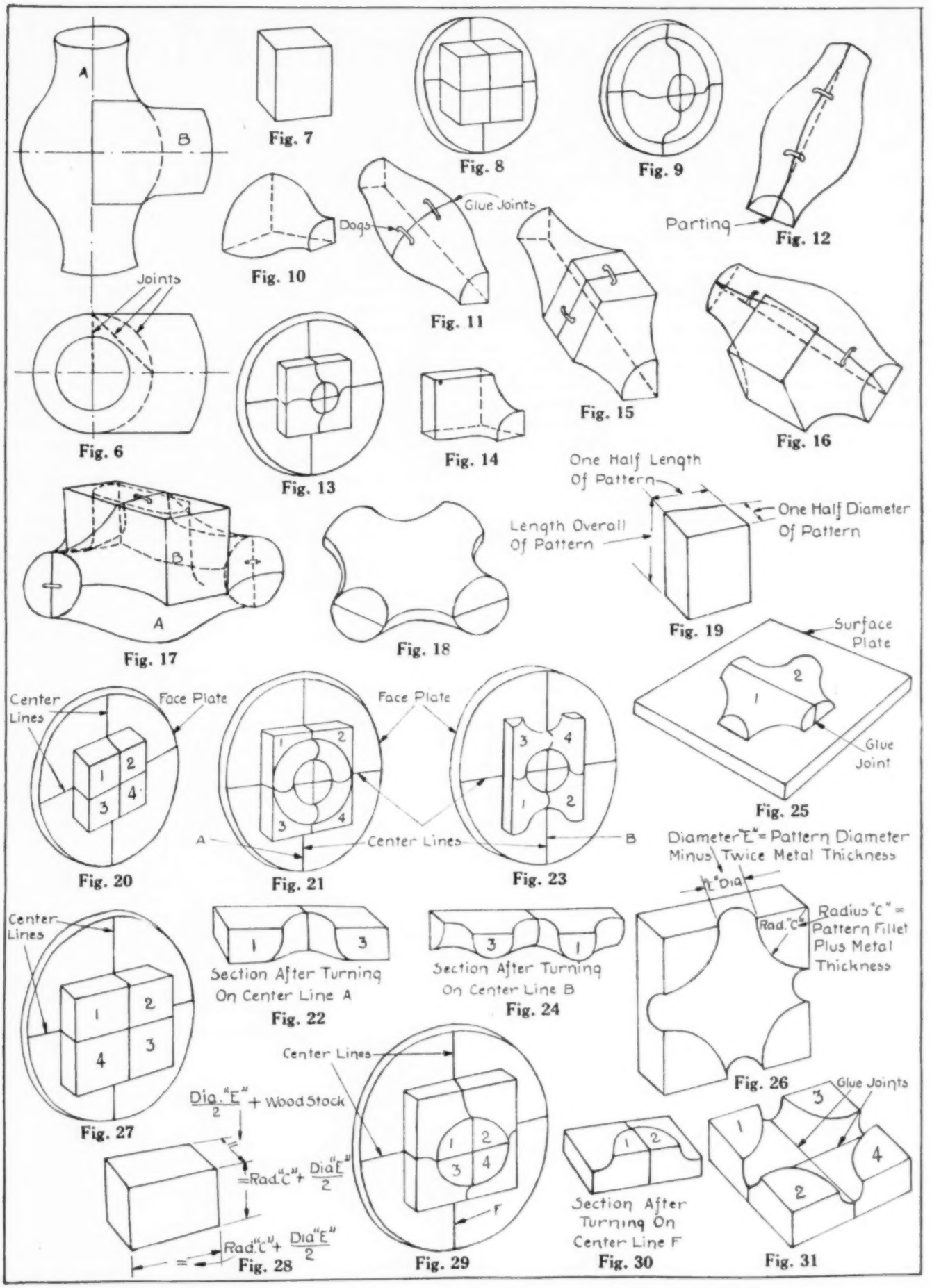
A more detailed discussion of the methods illustrated in Figs. 1 and 5 may bring out additional features. The four pieces are prepared as shown in Fig. 7. The pieces are ground to the same size and are fastened to the face plate. The edges of the blocks are placed on the center lines which first are marked on the face plate as in Fig. 8. The blocks are shown turned to shape in Fig. 9 and one of the blocks, which equals one quarter of the pattern section is shown in Fig. 10 after being turned and taken off the face plate.

Two of the quarters are shown joined and glued together in Fig. 11,

(*Concluded on Page* 535)



FIGS. 1 TO 5—A PATTERN OF THIS TYPE WAS BUILT OF EIGHT BLOCKS GLUED TOGETHER



FIGS. 6 TO 18—DETAILED METHOD OF CONSTRUCTING PATTERN FROM EIGHT PIECES TURNED ON THE LATHE. FIGS. 19 TO 31—THE PATTERN AND COREBOX OF THIS TYPE MAY BE MADE IN APPROXIMATELY THE SAME MANNER

(*Concluded from Page* 533)

one of them, of course, being turned end for end from the position it occupied on the face plate. These quarters are turned up at the same time, are all alike and may be matched easily on a surface plate. The remaining two quarters likewise are glued together and this makes two halves of the pattern section. In relation to the full pattern, they are placed one on top of the other, as in Fig. 12. One of the glued pieces makes part of the drag half and the other part of the cope half of the pattern.

To make the parts marked *B* four blocks are finished to the same size and similar to Fig. 7. They are fastened on the face plate as in Fig. 8 and turned as in Fig. 13. Fig. 14 shows one quarter detached from the lathe. It may be noted that the blocks are not turned down to the face plate as in Fig. 9 but a portion is left which eventually will be part of the branch and must be carved to shape by hand. Two of the quarters are joined as shown in Fig. 15. The parts shown in Figs. 11 and 15 then are glued together as in Fig. 16. In Fig. 17 the halves are shown doweled. The dotted oval lines shown on the side of *B* indicate the shape to which that portion is cut by hand.

Another example of wood turning is shown in Fig. 18. Practically the same method is used in making this pattern as in the previous example. In this case, four blocks are prepared similar to that shown in Fig. 19. Each block is equal to half the full length of the pattern in depth and equal to one half the width of the pattern in width. These four blocks make the full pattern, that is a drag and a cope side.

Center lines are drawn on the face plate and the blocks secured on each side of the lines as shown in Fig. 20. As shown in Fig. 21 a round hole then is cut into the blocks the same shape and radius as the fillet in Fig. 18 and shown in section in Fig. 22. The blocks are taken off the face plate and reversed, that is the lower blocks are moved to the top and the top blocks moved to the bottom, placing half of the bored hole, shown in Fig. 21, to the outside. The relative positions are shown by the numbers 1-2-3-4 in Figs. 21 and 23. A hole of the same size then is cut through the center of the block as shown in Fig. 23. A section of the blocks is shown in Fig. 24. After the blocks are taken from the face plate, they are glued together as illustrated in Fig. 25. Any two of the blocks glued together in the manner shown make one half of the pattern and the remaining two blocks the other half.

The complete core box for pattern is shown in Fig. 26. The core prints on the pattern and extension on the box are not shown since they are made in a separate operation. Diameter *E* equals pattern diameter less twice the metal thickness and radius. *C* equals the fillet of the pattern plus the metal thickness.

Four blocks used for the core box are cut as shown in Fig. 27. They are made one half of the diameter of the opening, plus the extra amount of wood on the back necessary to make the box substantial. In length and width, they equal the radius *C*, shown in Fig. 26, plus the radius of *E*. They are placed on the face plate as shown in Fig. 28 and turned as in Fig. 29. A section of the blocks is shown in Fig. 30. They then are assembled and glued as in Fig. 31.

German Group Discusses Sand Test Methods

The fifth-seventh annual meeting of the Association of German Foundries, Dusseldorf was held on June 1 and 2 in Stuttgart. Dr. Siegfried Werner, Dusseldorf, chairman of the association, presiding over the meeting. Three papers of interest and of a practical character were presented at the meeting. Professor Dr. Ing. Heidebroek, Darmstadt, dealt with Basic Questions Pertaining to Rationalization and Continuous Labor in the German Foundry Trade. Professor Kessner, Karlsruhe, discussed Sand Compression and Sand Strength, with Special Reference to Recent Molding Processes, and Director Sipp, Mannheim presented a paper on The Development of the Cleaning Room to the Present Time.

Professor Kessner discussed new experiments in the mechanical testing of finished molds in iron and steel foundries. The tests do not relate to specially prepared test pieces, but to finished molds in which the sand is rammed by various processes employed in actual practice. The determination of the sand compression as practiced with working molds shows divergent values according to the method of ramming employed. He noted that moisture, clay content and size of grain in the molding and filling sand have considerable effect on the ramming work or sand compression, the permeability to gas and the binding capacity.

A new process, differing from those hitherto employed in testing the density of the sand in flasks, was described. A freely falling weight leaves a definite impression in the mold. The depth of penetration with a given impact energy serves as a measure of specific sand density. To determine the binding strength of the molding sand rammed by any process, a sample of sand is picked out of the flask with a sheet-iron tube sharpened at the end, and slowly is pressed out by a screw until the free end breaks off. The binding strength then is ascertained in accordance with the laws of the strength of materials precisely as if it were a question of an overhanging beam breaking off owing to its own weight. To determine the gas permeability a sample is lifted out with the same tube from the rammed or pressed flask and examined by the well known process of Dr. Steinitz. The results clearly show the relation between the specific density of the sand, its binding strength and its gas permeability. These new testing methods have been adopted in different foundries. In this connection the lecturer mentioned that a new process of sand ramming employed by the Badische Maschinenfabrik in Durlach is of special interest. In this the ramming is done by a compressed air centrifugal molding machine, which gives a uniform compression of the sand in all the layers of the flask by means of a freely moving nozzle.

Getting the Buyers' Interested Attention

(*Concluded from Page* 511)

low a price, even when all other considerations are ignored.

When Harry was asked recently what qualities a castings salesman should have, he replied—"He should know his foundry costs; he should be backed by quality work at the foundry; he should be able to give service, and should actually give service."

Right here is one stumbling block. Many salesmen gradually work away from the operating end of the foundry. They lose contact with the order the minute it is entered. No salesman can afford to do this. He should make it his business to see that the customer receives service. Finally, the successful castings salesman should cater to the interests of the buyer, for after all, the buyer himself must make a profit, or he won't continue to buy.

Richards-Wilcox Mfg. Co., Aurora, Ill., has opened a branch office at 619 Hubbel building, Des Moines, Iowa, in charge of Lloyd D. Starks.

Little Foxes Eat the Grapes

Instances Are Cited To Show What a Trifling Factor in Many Cases Swings the Balance Between a Salable Casting and a Lump of Scrap Metal

By W. J. Clark

WHEN a casting is lost through some simple little oversight, the molder claims he is the victim of hard luck. I remember when a molder lost two 170-pound bronze bells from directly opposite causes, one after the other. He had made these bells from time to time in a three-part flask. They were poured from the bottom through thin runners and a feeding riser was placed over the top hub or boss. This boss was 3½ inches high, 2½ inches mean diameter in the 8-inch deep cope. These bells always had been satisfactory.

On a special occasion two bells were ordered with the hub or boss increased to a height of 4½ inches and a mean diameter of 3 inches. The molder made one according to the usual routine in the same flask, and lost it through shrinkage in the hub and cleavage between the hub and the lighter wall in the bell body.

On a second attempt he nailed a 2-inch upset on his cope and enlarged his riser reservoir to furnish a heavier feeding supply. From a shrinkage standpoint that was exactly the right thing to do.

The pouring gate as usual was kept level full to promote cleanliness of metal delivered to the mold. No shrinkage or cleavage appeared in the hub, but well down toward the bottom of the casting it was found that the sand between the drop sprue and the mold cavity had given way and had been forced bodily over into the mold thus completely ruining the casting.

FIG. 1—WHEN THE TOP PIECE WAS ENLARGED ON THIS BELL THE FIRST CASTING WAS SCRAPPED ON ACCOUNT OF SHRINKAGE AND THE SECOND BECAUSE THE SAND BROKE INSIDE THE RUNNER

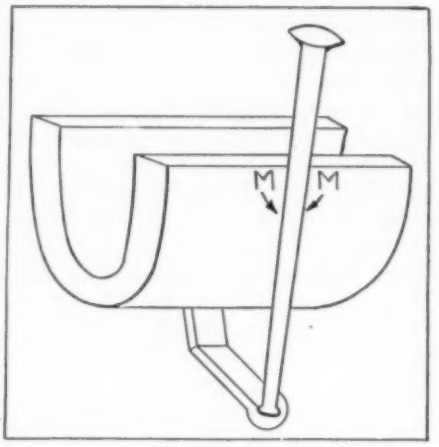


FIG. 2—IN THIS MOLD FOR A 900-POUND BEARING THE PRESSURE OF THE METAL IN THE SPRUE CAUSED THE SAND TO GIVE WAY IN FRONT OF IT

The molder couldn't understand why that should happen in this case when it never had happened before. The foreman sympathetically informed him that his 2-inch upset had increased his sprue height and thus imposed enough added strain or pressure around the bottom to overtax the sand between the sprue and the mold in that section. On a third attempt he moved his drop sprue farther away from the pattern, secured the sand between this drop sprue and the pattern and had no further trouble.

The instance was peculiarly outstanding in that the proper precaution observed by the molder to overcome his first loss led him unsuspectingly into the second. From that molder's experience I learned the early and valuable lesson of how slight and apparently insignificant are the causes that often lead to the loss of a casting.

The two lost castings might have been saved had proper measures been taken. If the molder had enlarged his riser reservoir and had built it up 2 inches above the top level of his cope, he would have had 5½ inches height of metal above the casting and a greater bulk of metal to feed back. After pouring the mold in the 8-inch cope he could have plugged the sprue at its top and then filled the riser up to its added height which would have taken care of shrinkage in the hub. If the sand in the second flask between the pattern and the sprue had been secured with cross rods, even at the closer distance it would have held. If the drop gate had been partitioned and the metal slightly checked in the connecting gate, the chances would have been more favorable. Even with the straight drop sprue, if the pouring had been done more cautiously until the mold was partly filled or if care had been taken to keep the pouring sprue within 2 inches of level full until the finish of pouring the trouble likely would have been averted.

Wherever metal exerts pressure against only one side of a partitioning body of sand in a mold, care must be exercised to protect that body of sand against one-sided pressure. Many castings have been lost through neglect of this simple precaution.

One was a 900-pound bronze half-liner requiring a full day to mold and pour. It was made *back down* and gated at the bottom as shown in Fig. 2. The sprue was filled at the beginning and kept full throughout the pouring period. Under safe conditions that is undoubtedly good molding practice since the force of metal falling from the ladle lip is absorbed by the pool of metal in the pouring head while dross remains there in great part. In this case the conditions were not safe. The molder had neglected to reinforce the sand between the

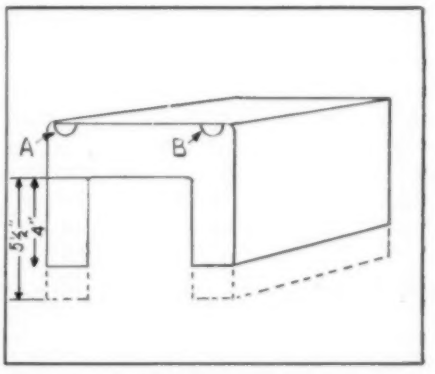


FIG. 3—WHEN THE DEPTH OF THE CORE WAS INCREASED FROM 4 TO 5½ INCHES IT BECAME NECESSARY TO USE TWO GATES TO PREVENT THE PRESSURE ON ONE SIDE FROM PUSHING THE CORE OVER

drop sprue and the pattern. The mold had been skin dried and the molder had shaved the parting back from the pattern to this drop sprue to avoid a dry sand crush. This left the sand body entirely unsupported and the metal pressure in the filled sprue forced this sand bodily over into the mold.

Require Two Gates

I lost a 120-pound crosshead liner by one-sided pressure. Like the bell casting these liners always had been made standard size with the channel 4 inches deep, 4 inches wide as shown in Fig. 3. I always had gated the mold with a single gate as at *A* and never had trouble. One day the pattern arrived with the channel depth increased to 5½ inches as shown by dotted lines. In this instance the greater metal strain first on one side shoved over the green core. The difficulty was overcome on the next trial by gating at *A* and *B*, thus delivering metal to both sides simultaneously and equalizing the strain on the core. Sand in the core might have been reinforced but the double gating was adopted as the easier and quicker method.

This tendency of metal to raise trouble against partitioning bodies of sand is not always due to strain or pressure. If there is any one place more than another where metal will rebel against hard tamping or wet sand this is it. The metal cuts or tears through either from the gate inward or from the mold backward or both. Many castings have been deflected to the scrap pile in this way.

A new molder in a foundry had for his first job two rod bushings gated at the top and made in a 14 x 18-inch flask as shown in Fig. 4. Out of his first heat of 10 flasks, three molds cut through. In the next heat he lost 5 molds in the same way. Then he quit. "I'll give it up," he said, "I rammed the sand as hard as I could between them and still the wall didn't hold."

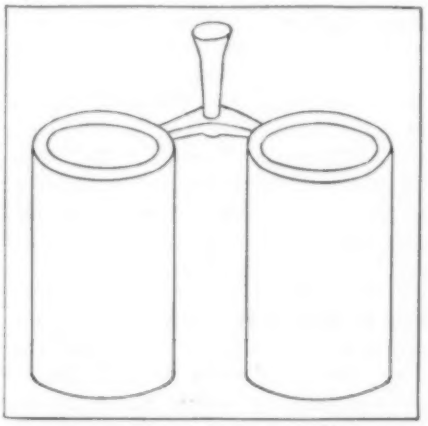


FIG. 4—THE BODY OF SAND BETWEEN TWO DEEP CASTINGS MUST BE RAMMED CAREFULLY TO PREVENT DISTURBANCE FROM THE CONFINED STEAM

In other ways metal strain either causes castings to be scrapped or increases their cleaning cost. Deep castings swell if not properly molded and sand burns on to the lower parts severely. Such castings should be made in rigid flasks with sand on the dry side firmly rammed around the deeper sections. Other castings, light or heavy exert an abnormal surface strain which lifts the cope sand and even the cope half bodily if the mold is not safely rammed, clamped and weighted. The scrap pile often is piled higher from this simple cause.

More than one casting has been ruined by hard pouring, particularly at the finish. They might have been saved if the pouring finish had been easier or if a relief riser had been taken off the casting at some point.

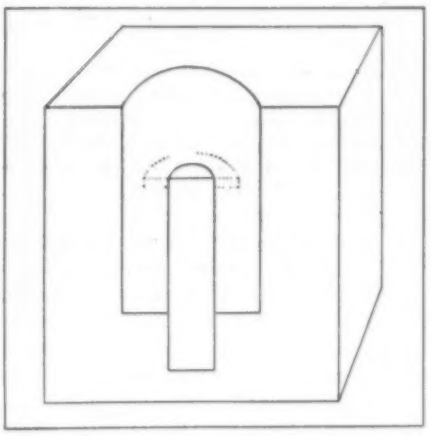


FIG. 5—DIFFERENCE IN SPECIFIC GRAVITY WILL CAUSE ANY UNSECURED CORE TO FLOAT IN A BODY OF METAL. THE HEAD ON THE CORE PRESENTS AN ADDITIONAL HAZARD

A 700-pound brass pump liner molded horizontally was lost by molding it in a weak flask. It was a thin-walled bushing 30 inches outside diameter, 15 inches in the cope with the gate metal 8 inches higher. The sand was rammed properly but the sides of the drag flask yielded under the pressure and the lower half of the casting overlapped the top by practically ⅛-inch.

Many castings find their way back to the furnace through the dislocation of cores. The great majority of these come from the action of the liquid metal on the core rather than from misplacement. Many molders do not realize the lifting or floating power of metal on a body lighter than the metal and immersed in it. Bushings both large and small are thicker on the drag side and lighter on the cope side from this cause.

Core prints should be provided amply long to support the core and to further secure the core in the prints in any of many possible ways against any chance of rising. Sometimes a core of great surface exposure or a core of unusual length will break or bend under pressure. Often this necessitates the use of chaplets. According to my experience wherever possible the practice of securely rodding the core is better than anchoring it.

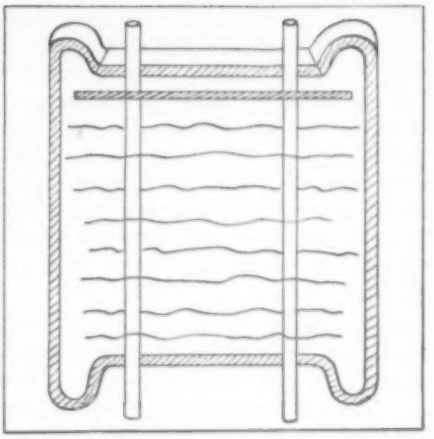


FIG. 6—THE TWO PIPES WERE ANCHORED ON THE TOP, BUT THE BODY OF THE CORE SLID UPWARD AND CUT THROUGH THE TOP OF THE CASTING

Floating Cores

A rather common delusion among molders is that metal first must get under the print of a core standing up in a mold to start lifting it. Fill the mold with metal as in Fig. 5, cut the core loose from the bottom and watch it pop up. Place a core endwise in the bottom of a ladle of metal, hold it down tight, then let it go and see it jump. The floating force in a mold may not be sufficient to lift a core abruptly out of its print. At the same time it may loosen the core enough to let metal work its way underneath and then the jig is up. If the core is of the umbrella type shown by dotted line in Fig. 5, it must be secured safely against a strong lifting power. Another fallacy sometimes entertained is that when metal completely envelops a core the lifting power is reduced to practically nothing. Test this theory. Shove a core deep into a ladle of molten metal. Release it and see if it stays there.

Fig. 6 shows an outstanding instance of core floating. The casting was a 500-pound bronze coil die and was molded vertically to avoid the use of chaplets. The casting had to stand a high hydraulic test. Iron pipes of print diameter were used for main supports extending through the core from print end to print end with cross rods laid in. After the core

was placed in the mold, the cope print ends were anchored firmly to prevent the core from lifting. The coremaker had neglected to fasten the cross rods securely to the pipes. He had not taken proper precaution to seal the core body to these main supports to resist a strong lifting power. Under pressure of the metal the core simply slipped up along the pipes and cut through on the top side.

If the pipes in the core had been bent irregularly instead of being straight or if a single cross rod close to the top of the core had been attached firmly and immovably to the main rods, or even if the main rods had been hacked or grooved and well covered with paste in setting. the loss could have been averted. These precautions, simple as they appeared afterward, were overlooked and the casting had to be remade.

If you pour horizontally a 3-inch diameter bushing, 10 inches long and with a ½-inch core, the core probably will *bow up* and form an arched instead of a straight hole in the casting. If the mold is inclined say 30 degrees from the horizontal, the perpendicular lift of the metal on the core is cut down accordingly and may be amply sufficient to save the core from yielding. In extreme instances it is necessary either to mold the bushing on end or anchor the horizontal core in the middle.

Many castings reach the scrap pile on account of *run out*, an evil as old and persistent as the foundry itself. On a pump body casting that took some 40 odd cores and required a full day to mold, the run out came from a cause rather uncommon yet at the same time perfectly natural. The mold, solidly rammed and vented had been clamped tight with soft dough strips between its partings. The mold and cores generated a great quantity of gas and ample provision was not made for that gas to escape. At the close of the pouring period the explosive mixture of accumulated gas and air went off with a bang that jarred things loose and started the run out that lost the casting. A more open sand or a more generous use of the vent wire would have saved that casting.

So many simple and natural causes contribute to run outs that no attempt will be made to consider them in detail. They include bad flask joints, gates or castings too close to the flask edge, soft ramming of partings, hard and violent finish of pouring, weak inadequate clamping or inefficient methods of drawing clamps, shallow sand under castings, bad bottom boards, disturbed parting surfaces especially those back of the gate or otherwise closest the flask edge, jarring of mold as sudden explosion of mold gases or metal coming up a riser against a cold or damp weight, etc.

Cutting and scabbing of the mold produce a goodly quota of defective castings in every foundry. Wet sand or hard rammed surfaces usually are held responsible. In many instances

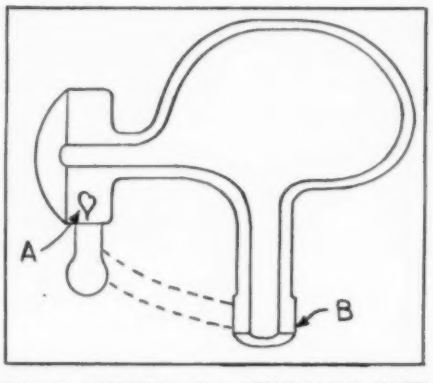


FIG. 7—CUTTING AN AUXILIARY GATE INTO THE BRANCH *B* CAUSED THE METAL TO DRAIN AWAY FROM THE BRANCH AT *A* AND LEFT A SHRINK CAVITY THERE

cuts and scabs are caused by one or two other and quite distinct causes. Either the grade of sand is not suited to the job or the mold has been made in green sand when it should have been made in dry sand, or at least in a skin-dried mold properly hardened. These two factors, the proper grade of sand for the job and the safe limit of green sand molding are closely related to the size of the scrap pile of any foundry.

Cutting, washing or scabbing in a mold often can be averted by some simple, inexpensive precaution in the gating, the pouring, the use of a dry core at some point, etc. The bell in Fig. 1 will illustrate. Over the flat top surface of the green core the metal often will boil, cut and scab. My invariable practice therefore is to use a dry slab core in this section.

Of all tributaries to the scrap pile, method of gating, the casting, I believe is the greatest. In a hundred and one different ways both in plan and execution, bad gates are responsible for an enormous number of castings that fail to go over the production scales. They do it in such an unsuspected, unforeseen, yet ever sure and natural way that the true molder is shamed to think he overlooked so simple a cause.

A few of the many evils possible from bad gating include cut-aways, wash-aways, gate pin holes, cope shrinkage, cleavage between light and heavy casting sections, dirty castings, bent, broken or dislocated cores, blown cores from metal-plugged vents, run outs, strained and swollen castings, sand burned castings, break ins, knock outs, etc.

Often a slight change or oversight in a gate will cause it to go from good to bad. The casting shown in Fig. 7 caused no trouble when poured through a single heavy gate at *A*. One day the metal was a little dull and the thin wall near *B* misrun. To guard against a possible recurrence a thin runner was cut from the sprue over to section *B* as shown on the dotted line. Castings gated in this manner had a pinhole in the heavy wall of section *B* drawn by the gate although the size of gate had not been changed. The long gate leading to section *B* had pulled just enough feed from the heavy gate at *A* to rob, the casting to the extent of the pinhole.

Shifted castings frequently are found in the scrap pile. They come from loose or worn pattern pins, loose or worn flask pins, unequal rapping of pattern parts of cope and drag, unequal swelling of castings, *ram off* from mismatching plates and other like causes. Where the casting is made in a flask with movable pins, the molder sometimes takes the pins out before clamping up to pour and the unequal pull of clamping throws the cope ¼-inch or more off.

Most bad castings come from molding or melting errors that might have been foreseen. Not many are purely accidental. A molder brought 800 pounds of molten brass to a bottom gated mold fitted up to be poured by the drop pouring method. The reservoir was made in a core and had a hole in the bottom into which a stopper core fitted to be lifted after the box was filled.

Paste was smeared over the bottom side of the head core to prevent it from shifting. Some of this paste worked up into the stopper core seat. When the metal was poured into the basin the paste baked around the end of the stopper core and it would not lift. Efforts to loosen it by twisting resulted in breaking it off short at the bottom leaving the hole still plugged. The box was lifted off carefully, metal dumped, core removed, box set back on the mold, new stopper core inserted and a second attempt made to pour. By that time the metal was so cold that it stopped running before the mold was more than two-thirds full. By straining a point the incident might be called accidental, but proper care and forethought would have prevented it.

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

RECOMMENDED PATTERN EQUIPMENT

Marking Gaged Surfaces and Locating Points on Patterns

When casting surfaces are to be gaged accurately, though not machined, gaged surface or points should be indicated by distinctive markings, such as by painting a special color or inserting a metal disk, care being taken so that the marking will not interfere with the pattern draw.

Locating points for machining operations should be indicated on the pattern by distinctive markings such as a color or metal disk insert, providing that the marking will not interfere with the pattern draw.

Both gaged surfaces and machining locating points of castings should be shown on the blueprints and that, wherever practical, locating points shall not appear on cored surfaces.

Markings Indicating Chilled Surfaces and Metal Inserts on Patterns

When internal chills or metal inserts are necessary that the word *chill* or *metal insert* be stamped on the place to be chilled or on the prints of the metal insert.

Color Ingredients of Coating Materials for Marking Patterns

When patterns are to be painted according to the committee's approved standard color scheme, that the paints or shellacs to secure the standard

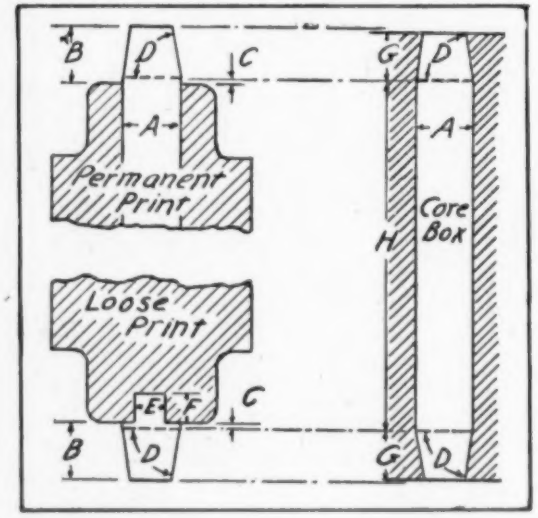


Fig. 1—It is essential that cope and drag prints are identical and that the dimension H in both core box and print correspond. When dimension H is increased, G also should be increased proportionately. Note the difference in overall length of core box and prints

These recommended practices have been approved by the Joint Committee on Pattern Equipment Standardization sponsored by the American Foundrymen's association.

(*Concluded on Data Sheet No. 676*)

RECOMMENDED PATTERN EQUIPMENT

(*Concluded from Data Sheet No. 675*)

color markings may be obtained by a medium vermilion red powder with white shellac for the red color, and a pale yellow ochre mixed with ordinary yellow or white shellac for the yellow color.

Pattern Letters

Pattern letters best suited for steel and brass castings are the round face or flat faced gothic pattern letters; pattern letters best suited for gray iron and aluminum castings are the sharp faced or hair line pattern letters.

Loose Pieces for Pattern and Core Boxes

All loose pieces for patterns and cores, and the prints for the loose pieces on the patterns and core boxes be marked consecutively so that a No. 1 loose piece will fit a No. 1 print, a No. 2 loose piece will fit a No. 2 print, etc. Further that when right and left loose pieces are called for that the print be stamped *R* or *L* and the letters *R* and *L* be stamped on the respective loose pieces. As a factor of safety, it is recommended that the patternmaker use one small and one large dowel pin to eliminate the danger of loose pieces being reversed.

Core Prints for Metal Patterns

Recommended practice for use in determining the size and shape of core prints for metal patterns is presented in Figs. 1 and 2.

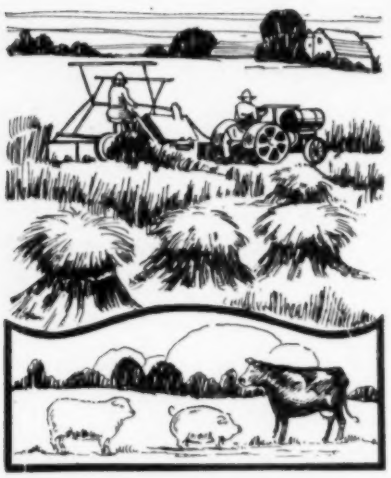
A	B	C	D	E	F	G	H
3/16	17/64	1/32	88°	1/8	3/16	15/64	1 1/2
7/32	19/64	1/32	88°	1/8	3/16	17/64	1 1/2
9/32	21/64	1/32	85°	1/8	3/16	19/64	1 3/4
5/16	23/64	1/32	85°	1/8	3/16	21/64	1 3/4
11/32	25/64	1/32	85°	3/16	3/16	23/64	2
3/8	27/64	1/32	85°	3/16	3/16	25/64	2
13/32	15/32	3/64	85°	3/16	3/16	27/64	2 1/2
7/16	1/2	3/64	81°	3/16	3/16	29/64	2 1/2
15/32	17/32	3/64	81°	1/4	1/4	31/64	2 3/4
1/2	17/32	3/64	81°	1/4	1/4	31/64	2 3/4
17/32	9/16	3/64	81°	1/4	1/4	33/64	3
9/16	9/16	3/64	81°	1/4	1/4	33/64	3
19/32	37/64	3/64	76°	3/16	1/4	17/32	4
5/8	19/32	1/16	76°	3/8	1/4	17/32	4

A	B	C	D	E	F	G	H
21/32	5/8	1/16	76°	3/8	3/8	9/16	4
11/16	5/8	1/16	76°	3/8	3/8	9/16	4
23/32	21/32	1/16	76°	3/8	3/8	19/32	4
3/4	21/32	1/16	76°	3/8	3/8	19/32	4
13/16	23/32	1/16	76°	3/8	3/8	21/32	5
7/8	25/32	1/16	76°	3/8	3/8	23/32	5
15/16	25/32	1/16	76°	3/8	3/8	23/32	5
1	53/64	5/64	76°	3/8	3/8	25/32	5
1 to 1 1/4	55/64	5/64	76°	1/2	1/2	27/32	6
1 1/4 to 1 1/2	1 1/16	3/32	76°	1/2	1/2	31/32	6
1 1/2 to 1 3/4	1 5/32	3/32	76°	1/2	1/2	1 1/16	6
1 3/4 to 2	1 9/64	7/64	76°	1/2	1/2	1 3/16	6
2 to 2 1/2	1 7/16	1/8	76°	3/4	5/8	1 5/16	8
2 1/2 to 3	1 9/16	1/8	76°	3/4	5/8	1 3/16	8
3 to 4	1 13/16	1/8	76°	1	3/4	1 11/16	10

Fig. 2—Letters heading the columns correspond to those dimensions shown in Fig. 1

Seeing America with The Foundry

Little Journeys to the homes of our readers



KANSAS has a total of 43 foundries of which

39 Melt Gray Iron
3 Exclusive non-ferrous
25 Aluminum

KANSAS the "SUNFLOWER STATE" lies exactly in the geographical center of the United States. This state is among the most progressive states and has no state debt and as far back as 1881 did not license saloons. It was first peopled by pioneers who reached the territory in "prairie schooners" and was contested ground on the question, for its admission as a state occurred on January 29, 1861, just as the clouds of the Civil War were gathering.

The area of Kansas is 82,158 square miles which is more than twice that of Ohio and its population in 1920 was 1,769,257 an average of 21.6 people to the square mile, as compared with 36.5 to the square mile for the entire United States.

Agriculture is the chief industry of the state. The soil is fertile, and the climate is well suited to the growing of all products that can be raised in a temperate climate. The central portion of the state is devoted to raising winter wheat and in the production of this variety of wheat Kansas leads the other states of the Union. Kansas as a wheat producing state produces 15% of the nation's wheat crop. The upper Arkansas Valley, in the western section, has considerable sugar-beet culture, principally in Finney and Kearny counties. Large numbers of cattle, horses and sheep are marketed every year and the wool clip is large.

Compared with agriculture, manufacturing is of minor importance. The leading industries are slaughtering and meat packing with Kansas City next to Chicago in this respect. Large quantities of soap, butter, cheese and condensed milk are made. The manufacture of flour and other grist-mill products, beet sugar and machine shop products are some of the more important industries.

In KANSAS—THE FOUNDRY has 26 paid subscribers

"Wherever metals are cast you'll find THE FOUNDRY"

He Could Encircle the Earth

With Radiator SECTIONS

FOUNDRYMAN ARCHER A. LANDON
—found idleness the most burdensome of all burdens

ARCHER A. LANDON, prominent citizen of Buffalo and maker extraordinary of radiators and boilers by which the American home is heated, probably has Accelerator for a middle name. Early in his career he was given the opportunity to sit in the driver's seat of the American Radiator Co. band wagon. He set his foot on the accelerator in such an enthusiastic and able manner and coaxed such a succession of speed records out of that vehicle, now converted into a racing car, that the sales department had to sit up nights to find an outlet for the production of the various plants. The directors were kept busy shifting him from one position to another, each succeeding position carrying more responsibility and incidentally supplying new speedways on which to try out some new racing ideas.

He started as a machinist apprentice and when he decided to take a rest in 1924 the sign on his office door read Assistant to the President. He had held that office for four years and for the preceding 15 years he had been general superintendent of the 57 (more or less) plants operated by the American Radiator Co. in this country and in Europe. Added to the almost innumerable land miles covered in pursuit of his duties, his sea record leaves Jules Verne's hero of *20,000 Leagues Under the Sea* tied to the mast and gasping for breath. Our hero has crossed the well known western ocean and returned 23 times. At a conservative estimate of 5000 miles for the round trip we come to the inescapable conclusion that this betters Captain Nemo's record approximately in the proportion of 4 to 1. Also it may not be out of place to mention that several trips were made during the war years and conceivably were much longer than usual on account of the zigzag path adopted by the skippers as precautionary measures.

The subject of these memoirs was born in Detroit in 1868, but beyond acquiring the ability to chew tobacco, he showed little effect of the educational school system which he endured until he was about 14. Then he entered a railroad machine shop and further developed his tobacco chewing technique while absorbing enough machine shop practice to enable him to claim a card when he had finished the allotted period.

For a few years he lived the gay butterfly life of the young journeyman of that period. He was a committeeman of the local, he attended conventions and he championed the cause of the poor, but honest working man. The training stood him in good stead in the war years when the late President Wilson called him to Washington as head of the industrial conference board at the munificent salary of $1 a year. Knowledge gained from practical experience on both sides of the fence facilitated the solution of many problems brought up during this stormy period.

To him who hath shall be given. He had hardly taken over his new duties and applied for an advance on his salary when he had three similar jobs, each carrying the same munificent salary of $1 a year, thrust upon him. He was appointed chief of the air-craft production board, representative of the national industrial conference board on the special body of advisors to Secretary Wilson and organizer of the war labor board. In his spare time he kept a paternal eye on the affairs of the American Radiator Co., and served as president of the Buffalo chamber of commerce. Between one thing and another he

managed to work full time every month.

In the early years of the war he developed a method for making cast iron shells and then went to Europe where he introduced the methods in the various plants operated by the American Radiator Co. It would have been all the same if the allies had wanted two-gallon pots or flat irons. He would have invented a method for making them by the thousand where formerly they were made by the hundred. Beside him the mythical person who is credited with making two blades of grass grow where only one grew before is only a piker.

Turning our attention again to the early 90s we find that the future captain of industry got a job as a machinist in one of the Detroit branch plants of the American Radiator Co. Instances of mechanical skill and inventive genius attracted the attention of his superiors to the extent that many of his ideas were adopted and tried out under working conditions. Then he was placed in charge of one of the branch plants and practically given a free hand. In 1901 he was placed in charge of the Pierce plant in Buffalo. In 1905 he was appointed general superintendent of all the plants of the company and in 1920 he was named assistant to the president.

After four years of this he decided he needed a rest.

"Why," said he to himself, "Why should I continue to work 24 hours a day? Me for the great open spaces where men are men and do not need radiators to keep them warm."

He worked diligently at the new job for two years and then like many a good man before and since Solomon's time, he found that idleness is the most burdensome of all burdens.

In 1926 he organized the Landon Radiator Co. and acquired a foundry property in North Tonawanda, N. Y., a town which, of course, every person knows is next door to Buffalo on the north. He took off his coat and vest, figuratively speaking, took a fresh chew of tobacco without any figurative frills and proceeded to equip the shop to his own personal liking and in a manner that embodied the result of experience gained over a period of many years. Back on the job, healthy and busy he has the creator's pride in seeing his machines measure up to expectations and set up new records in production and economical operation. With the maturity of years he still combines the enthusiasm of youth.

Care Needed in Handling Materials

MATERIAL handling operations afford a wide field of opportunity for the prevention of accidents, according to *National Safety News*. Cut and crushed fingers, hands, toes and feet, broken legs and arms, strained backs and ruptures all are too frequent occurrences. This is true especially in the handling of scrap metals, pig iron, etc., by hand. The following list will serve as a reminder of some of the things that can be done to prevent these accidents:

Insist upon the workman wearing hand leathers or leather mits, preferably studded with steel; not cotton gloves.

Encourage him to wear special safety shoes having re-enforced toe caps to protect the toes from being crushed.

See that good order is maintained at storage piles and bins and that the materials are piled properly.

Maintain even ground and floor surfaces so men handling materials will have good footing.

Provide adequate side stakes or side boards on tramway or railroad cars to prevent materials falling off.

Keep wheelbarrows, trucks and tram cars in good condition. Equip wheelbarrows with knuckle guards.

Schedule orders for material so that there will be no temptation to overload cars or trucks.

Display posters showing correct methods of lifting and other pertinent safe practices.

Consider the appointment of gang safety leaders and the inauguration of no-accident competitions between gangs or teams.

In so far as possible, provide hand tools, the use of which will cause the men to keep their hands and feet away from danger.

Provide goggles for use on windy days or on work in which flying particles are liable to cause eye injuries.

A number of foundries have replaced many former hand methods with material handling machinery. The reduced exposure to injury is obvious. However, the machinery usually involves special hazards that must be taken into account. For instance, lifting magnets are dangerous if swung over spaces where men are at work. A broken magnet circuit causes the magnet to release its load and this is liable to take place without warning. Furthermore, pieces dangling from the magnet sometimes are jarred loose easily.

In handling such materials as sand, coal and coke such dangers as the following are met.

Men sliding through hoppers with the material when unloading bottom dump type railroad cars.

Hopper car door wrench swinging around and striking the worker while he is trying to release the bottom dump gates.

Pinch bars slipping and injuring hands and feet when "spotting" cars by hand.

Accidental shifting of cars while men are working in, or under them.

Caving in of piles of material caused by undermining. This is especially dangerous in winter when the upper crust is frozen.

The foregoing hazards can be decreased in the following ways:

By requiring the use of safety belts and life lines by men whose duties require them to enter cars to push down material. Men should never do this work alone.

By using only hopper car door safety ratchet wrenches.

By using safety car movers instead of ordinary pinch bars.

By using warning targets, derails, red lanterns at night and locking switches.

By prohibiting the undermining of piles.

Some foundries have reduced the necessity for double handling by having the raw materials put directly into unit charging trays or boxes from the cars, storage piles or bins. These are then taken to the furnaces or other points where the material is to be used and dumped mechanically, thus obviating any further hand handling.

Manganese bronze, S. A. E. specification No. 43 calls for the following composition: Copper, 53.00 to 62.00 per cent; zinc, 38.00 to 47.00 per cent; lead, max. 0.15 per cent. This metal may be hardened by the addition of small amounts of tin, iron, manganese, aluminum or a combination of these metals.

Milestones in Foundry Progress

As Recorded in the July Issue of THE FOUNDRY, Thirty, Twenty and Ten Years Ago

1897

ECHOES of the second annual convention of the American Foundrymen's association continued to reverberate through the July, 1897, issue of THE FOUNDRY, J. P. Pero, active at that time, later president and one of the committee which reorganized the association and set it on its feet in later years, discussed foundry management in commenting on the address of President Schumann. The paper by James A. Beckett on cupola practice was given in full. Pictures and biographies of district vice presidents, William E. Sessions and Isaac W. Frank, just elected, were given.

* * *

Mr. Frank still is an active and influential member of the industry in the Pittsburgh district.

* * *

Detailed proceedings were given of that hilarious and entirely fictitious organization known as the Plumbago club, including a fake telegram from Joseph S. Hibbs on a proposed duty of 100 per cent on plumbago, and a learned paper on glue in plumbago by H. S. Vrooman.

* * *

RUTHLESS RHYMES

Here's to the club called Plumbago,
That met many long years ago,
Its meeting delirious,
Never quite serious,
Refrained from all H two and O.
A. V.

* * *

The scrap pile is an item of expense, a page in the volume of experience, the torment of the careless, the guide and textbook of the observant and the might-have-been of the employer.—Tubal's Meditations.

* * *

Robert E. Masters, veteran of the industry resigned his position as manager of the Marshall Car Wheel & Foundry Co., Marshall, Tex., on July 31, 1897. This plant had grown to an annual output of 24,000 wheels under Mr. Masters' management.

* * *

The Buckwalter Stove Co., Royersford, Pa. had just erected a new office building.

* * *

The Philadelphia Foundrymen's association discussed a new cupola in which steam was to be introduced at the tuyeres instead of air.

* * *

From this question, it was only a step to get into an argument on wetting coke and whether a cupola really did operate better in wet weather. These subjects still serve to introduce warm words.

Faked Foundry Facts

Loose Pins

1907

PHILADELPHIA'S second convention of the American Foundrymen's association was reported in full in the July, 1907 issue of THE FOUNDRY. At this time Stanley G. Flagg, Jr. was elected president. Dr. Richard Moldenke was secretary-treasurer. The attendance was about 1300.

* * *

Photographs of prominent members, reproduced in THE FOUNDRY, prove beyond doubt the popularity of derby hats, and some kind of facial fur in those days.

* * *

The old method of buying by fracture, rapidly was disappearing and the association's standard specifications were the basis of pig iron purchases.

* * *

W. H. McFadden, in his opening address as president, pointed to the growth of standard methods of testing, the need for cost accounting, apprentice training and better metallurgical practice.

* * *

W. S. McQuillan compiled some interesting data on comparative cupola operation.

* * *

The American Brass Founders' association was organized at the Philadelphia American Foundrymen's association convention. Its organization was patterned closely after that of the American Foundrymen's association and the officers chosen included Charles J. Caley, president; J. H. Sheeler, treasurer; Andrew M. Fairlie, secretary, with different sectional vice presidents.

1917

WAR effects were becoming apparent in the foundry industry, as may be noted from scanning the articles in THE FOUNDRY of July, 1917. Following a short curtailment, orders were increasing. The investigation of cast iron for semisteel shells was suggested. Prices of pig iron were advancing, low phosphorus grades of special analysis being offered for $82.50, while No. 2 foundry was above $50 a ton. Ferromanganese was quoted at $425 a ton, and ferrosilicon, 50 per cent, was $250 a ton. Heavy melting steel was selling between $35 and $45 a ton in different localities.

* * *

Long time contracts were sought by buyers, but deliveries were delayed under advancing markets.

* * *

The early use of permanent molds for castings was discussed by Alexander E. Outerbrige Jr., Wm. Sellers & Co., Philadelphia.

* * *

The new plant of the Ecorse Foundry & Machine Co., Ecorse, Mich., was put in operation.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Who'll Bell the Cat

TWO THOUSAND years ago Aesop composed the story of The Cat and the Mice. In common with all the other works of an old master who possessed an exceedingly keen insight into human nature, the moral of the story is as applicable today as it was in the days when Aesop, the barefoot slave scratched the story in the sands of the beach for the pleasure and edification of his master's son. A number of mice met in solemn conclave to deplore their unfortunate position and to denounce bitterly the predatory habits of their mortal enemy the cat. This ferocious beast with its uncanny ability to glide around like a shadow on velvet paws and pounce unexpectedly on a victim, had reduced the mice to a condition of hopeless and almost inarticulate terror.

BRAVERY induced by numbers led several to express their opinion of the intolerable condition under which they were forced to exist. Numerous plans, suggestions and solutions of the problem were presented for consideration, but without exception they were dismissed as visionary, impracticable and hopeless. Finally, one bold spirit secured recognition from the chair and proposed hanging a bell around the cat's neck. He pointed out quite logically that every time the cat moved the bell would ring and thus warn the victim and give him time to escape. The motion seemed in a fair way to prevail until one incurable pessimist rose to a point of order and asked who would attach the bell.

FOUNDRYMEN meet in small and large groups and bitterly denounce a market in which castings are sold in some instances for a price that does not cover operating expense. They blame this, that and the other thing for existing conditions. Competition from careless and sometimes unscrupulous operators ignorant of their costs is the big black cat in the problem. Ultimately perhaps through a process of education a method will be developed for hanging a bell that will ring the cat out of the picture.

¶ Produce More Steel Castings

PRODUCTION of steel castings in 1926 continued the upward trend noted during the past three years, according to a statistical bulletin recently published by the *American Iron and Steel Institute*, New York. Total tonnage last year amounted to 1,357,558 tons as compared with 1,252,786 tons in 1925. This gain in output of 8.3 per cent in 1926 falls slightly under the gain of 11.9 per cent recorded in 1925. With the exception of 1923 when all records were broken, the production in 1926 is the largest since the war years of 1917 and 1918 when 1,441,407 and 1,411,410 tons respectively were produced.

AGAIN the production of electric steel castings showed the greatest increase. The output of electric steel castings in 1926 was 326,445 tons, a new high record and a gain of 16.75 per cent over the production in 1925. It is interesting to note that in 1926 the tonnage of electric steel castings was 33 per cent of that of open hearth castings, while in 1916 production by the electric process was only 4.45 per cent of the open hearth output.

INCREASE in crucible steel casting production ranked second in percentage although last in tonnage. Basic open hearth increased from 455,282 tons in 1925 to 480,627 tons in 1926 or 5.55 per cent while the acid open hearth increased from 462,303 to 491,298 tons, or 6.3 per cent. The output of bessemer steel castings increased from 53,634 tons in 1925 to 56,947 tons in 1926, or a gain of 5.77 per cent. More alloy steel castings were poured than ever before, the production being 146,101 tons against 112,583 tons in 1925.

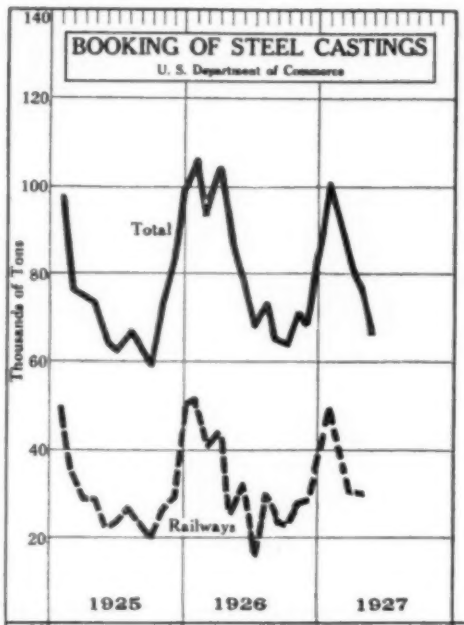
Production figures indicate that the steel casting industry is in a healthy condition and is making steady progress. This conclusion is substantiated by a study of equipment purchases during the first half of 1927. Reports from various sections of the country indicate steel foundries have been replacing melting units and adding units which will greatly increase the capacity of steel foundries in the United States.

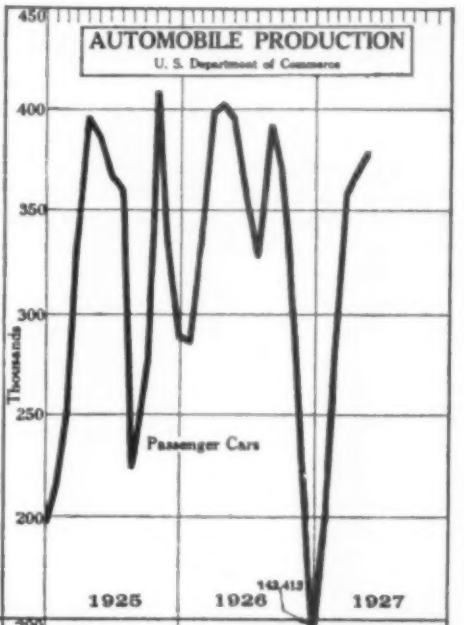
Trade Trends in Tabloid

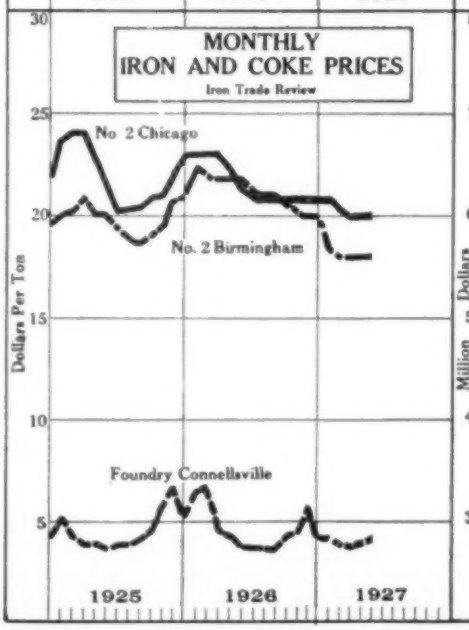
JUNE witnessed little change in foundry operations, the market for castings continuing irregular. Decline in the retail demand for automobiles is reflected in the production of automobile jobbing shops. Production of passenger cars in May totaled 374,569, an increase of 393 over April but a decline of 20,000 over the output in May, 1926. Preliminary reports indicate that a substantial reduction will be shown in production for June as compared with May. Bookings of steel castings in May totaled 66,425 tons compared with 78,282 tons in April. Production was 61 per cent of capacity or 81,671 tons in May against 68 per cent or 90,498 tons in April. Increased buying of equipment by railroads should develop additional business for foundries making railroad castings. During May railroads purchased 5100 freight cars compared with 3300 cars in April and 448 in May, 1926. Car awards during the first week in June exceeded by 4285 the total awards in that month a year ago. Orders for bath tubs increased from 98,762 in April to 109,211 in May and orders for sinks increased from 115,247 in April to 118,168 in May. The average melt in Ohio, as reported by the Ohio State Foundrymen's association, was 86.5 per cent of normal in May compared with 90.6 per cent in April and 76.2 per cent in May, 1926. Nonferrous foundries were operating at 73.8 per cent in May.

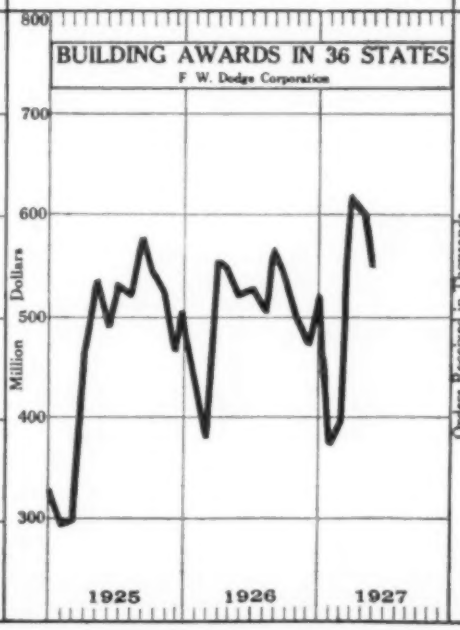
RAW MATERIAL PRICES
June 22, 1927

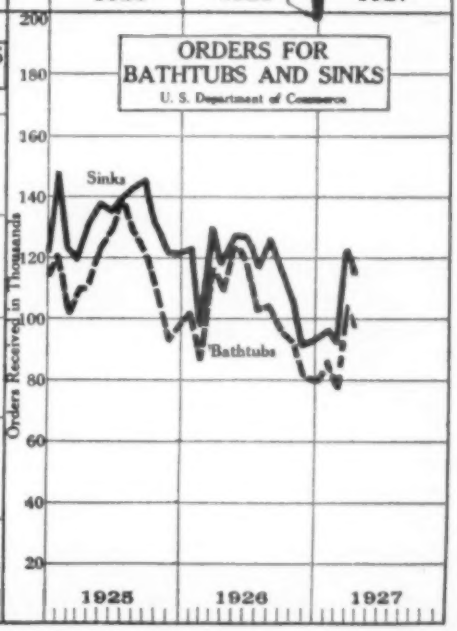
No. 2 foundry, Valley	$18.00 to 18.50
No. 2 southern, Birmingham	18.00
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.26 to 22.26
No. 2 foundry, Buffalo	17.75 to 18.00
Basic, Valley	18.00
Basic, Buffalo	17.25 to 17.75
Malleable, Chicago	20.00
Malleable, Buffalo	17.75 to 18.00
Coke	
Connellsville foundry coke	$4.00 to 4.50
Wise county foundry coke	6.00
Scrap	
Heavy melting steel, Valley	$15.00 to 15.50
Heavy melting steel, Pitts.	14.75 to 15.00
Heavy melting steel, Chicago	12.00 to 12.50
Stove plate, Chicago	12.25 to 12.75
No. 1 cast, New York	14.00 to 14.50
No. 1 cast, Chicago	14.75 to 15.25
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	15.00 to 15.50
No. 1 cast, Birmingham	14.00 to 15.00
No. 1 cast, Buffalo	15.50 to 16.00
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	13.50 to 14.00
Railroad malleable, Chicago	13.50 to 14.00
Agricultural, Mal., Chicago	13.00 to 13.50
Malleable, Buffalo	16.00 to 16.50
Railroad malleable, Pitts.	15.00 to 15.50
Nonferrous Metals	Cents per pound
Casting copper, refinery	12.37½
Electro copper, producers	12.50
Straits tin	67.50
Lead, New York	6.40
Antimony, New York	12.37½
Nickel, electro	39.00
Aluminum, No. 12, prod'rs	24.50
Aluminum, No. 12, remelt	18.50 to 19.50
Zinc, E. St. Louis, Ill.	6.20 to 6.22½











Comings and Goings of Foundrymen

WILLIAM K. FRANK, formerly vice president of the Damascus Bronze Co., Pittsburgh, is vice president in charge of the Pittsburgh district for the National Bearing Metals Corp., New York and St. Louis, which is the name of the recently consolidated Damascus Bronze Co., and Keystone Bronze Co., Pittsburgh; the More-Jones Brass & Metal Co., St. Louis; Bronze Metal Co., New York; Southern Brass Works, Portsmouth, Va., and Brady Brass Co., Jersey City. The Keystone company started business in 1890 and the Damascus company in 1879. Mr. Frank is the son of Isaac W. Frank, chairman of the board of the United Engineering & Foundry Co.

L. C. Polk, Seattle, representing the American Cast Iron Pipe Co., in that city, has returned from a business trip to Honolulu.

J. D. Young, formerly employment manager, Wilson Foundry & Machine Co., Pontiac, Mich., has been named assistant general manager of the Dunham Co., Berea, O.

John R. McDonald, president, Erie Foundry Co., Erie, Pa., was injured recently in an automobile accident. After treatment in an Erie hospital, he returned home and is recovering.

Bert E. Weidle, formerly associated with the American Radiator Co., Buffalo, now is in charge of operations in the plant of the newly formed Lancaster Malleables & Steel Corp., Lancaster, N. Y.

James W. Gorman has resigned his position as foundry foreman with the Toledo Machine & Tool Co., Toledo, O., to accept a position as foundry superintendent with the Illinois Iron & Bolt Co., Carpentersville, Ill.

Henry T. Burr recently was elected secretary of Landers, Frary & Clark, New Britain, Conn., at a meeting of the board of directors to succeed Edward F. Hall. Mr. Burr has been with the firm for 9 years and first was named comptroller and later auditor of the company.

Albert E. Brenneman who recently became associated with the Armstrong Foundry Co., Racine, Wis., as superintendent served his apprenticeship with the York Mfg. Co., York, Pa. After serving his apprenticeship, he worked in various gray iron, steel, brass and aluminum foundries throughout the country to gain experience, and in 1910 became connected with the National Steel Casting Co., Milwaukee. After a short time he was appointed foreman. In 1918 Mr. Brenneman became associated with the American Brake Shoe & Foundry Co., Chicago, as foreman. In 1920 he went with the Huntington Steel Foundry Co., Huntington, Ind., as superintendent and in 1924 became associated with the Union Steel Casting Co., Pittsburgh.

To Hold Short Course

A short course in industrial gas engineering will be held from June 20 to July 2 at the University of Illinois, Urbana, Ill. The course is being offered by the Illinois Gas association and will include combustion, furnace construction and design, industrial heat applications, economics of modern factory production, temperature control, insulating materials, etc. Included in the faculty are: Prof. W. Trinks, professor of mechanical engineering, Carnegie Institute of Technology, Pittsburgh; Prof. E. E. Ferris, professor of salesmanship, New York university, New York; Prof. F. A. Russell, professor of organization and operation, University of Illinois; Prof. Vincent S. Day, professor of special research, University of Illinois; Kirke Taylor, president, National Association of Purchasing Agents; and William A. Darrah, president, Continental Engineering Co.

Made Representative

F. M. Malany, Singer building, New York, has been appointed representative in that district for the Stewart Die Casting Corp., Chicago. Mr. Malany was formerly superintendent and chief engineer of the war department in charge of operating and construction in the canal division. He served as captain in the engineering corps during the war and saw active service in France.

To Publish Bulletin

Due to the number of inquiries for names of manufacturers of various trade alloys, received by the Institute of Metals (London), it has decided to compile a list of the alloys with particulars of composition, uses, and names of manufacturers or agents in Great Britain. Interested parties may communicate with the secretary, 14 Member's Mansions, Victoria street, London, S. W. 1 giving particulars.

Elected President

Edward Kahl, formerly vice president and secretary, has been elected president and treasurer of the Interstate Foundry Specialties Corp., 461 Fourth avenue, New York City. He succeeds S. H. Cleland who has resigned to become vice president and general manager of Eastern Clay Products Inc., Buffalo. Henry A. Wight has been appointed vice president and secretary. Mr. Kahl has long been associated with the foundry field. Prior to his affiliation with the Interstate Foundry Specialties Corp., he was associated for 12 years with Stein Hall & Co. For several years he was assistant to the president of that company.

Is Advertising Manager

J. W. Marshall has been appointed advertising manager of the Quigley Furnace Specialties Co., New York. He formerly was manager of the publicity division, Pittsburgh office, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and has been associated with the American Nickel Corp., and G. P. Blackiston.

Buffalo Foundrymen Meet

At the regular monthly meeting of the Buffalo Foundrymen in the club rooms at 146 Chandler street on June 15, H. B. Hanley, Whitehead Bros. Co., Rochester, N. Y., assisted by B. J. Fuller, Whitehead Bros. Co., Cleveland, gave an illustrated talk on molding sands.

Appoints Distributor

Penhallegon Foundry Supply Co., Birmingham, Ala., has been appointed distributor in the Birmingham district and a portion of Alabama by the S. Obermayer Co., Chicago, manufacturer of equipment and foundry supplies.

In melting aluminum or aluminum alloys the metal should not be overheated due to its affinity for gases when in the molten condition.

When To Open Slag Hole

Question: We melt 6 tons of stove plate scrap each heat and use oyster shells for a flux. When is the best time to open the slag hole? Is there any disadvantage in opening too soon?

Answer: The time for opening the slag hole is reckoned on the time the cupola is in blast and not on the weight of the charge. For example you could melt 6 tons of iron in a 60-inch cupola in less than half an hour. You would require no flux of any kind and the amount of slag scarcely would be noticeable. If you melt the same amount of iron in a 24-inch furnace you will have to add a fluxing agent to every charge and then draw the slag away regularly for a couple of hours. Otherwise the cupola will choke. In the average foundry the size of the cupola is based on the amount of iron that will be required over a period of two hours. The slag hole usually is opened after the cupola has been running from ¾ to 1 hour. This depends on the condition of the cupola the character of the charge and the amount of slag that has collected. In many foundries the slag hole is made up the same as the tap hole and left open from the beginning to the end of the heat. Some foundrymen insist on opening and closing the tap hole at regular intervals. They claim that a certain amount of the blast is lost while the slag hole is open. There is no disadvantage in opening the slag hole too soon. The average foundryman usually refrains simply because there is no slag in the furnace until it has been running for some time. Generally, the slag hole is opened about one-half hour after the iron begins to melt.

Obituary

Horace Roger Thurber, aged 76 years, a pioneer in the farm implement industry, died recently at his residence in Auburn, N. Y. Mr. Thurber started with the McCormick Harvesting Machine Co., Columbus, O., and in 1889 became its branch manager in Rochester, N. Y. When the larger implement companies amalgamated in 1902 to form the International Harvester Co. of America, he became manager at its various Canadian branches, and later at the Auburn, N. Y. branch.

Charles R. Wood, aged 58 years, associated with R. D. Wood & Co., Philadelphia, for many years, died in Chicago June 8, where he was attending the convention of the American Water Works association. He was educated at Haverford college, Haverford, Pa., and was associated with his father in the manufacture of glass following his graduation. Later he entered the employ of the R. D. Wood & Co., and at the time of his death, was manager of its valve and hydrant sales department.

To Celebrate Twentieth Anniversary

The Institute of Metals (London) will celebrate its 20th anniversay next spring. This organization was founded in 1908 with a membership of less than 200. At present the institute has over 1800 members and expects to register its 2000th member before celebrating its anniversary.

Annual Picnic Is Held

The Quad City Foundrymen's association held its annual picnic at Maple Lane inn, Rock river, near Moline, Ill., on June 25. Bob Eichman was general chairman and he was assisted by Leo Starner, Stanley Olsen, Bill Seiffert and Herman Alex in arranging the dinner and the games.

Handles Foundry Supplies

Paxson-Taggart Inc., Philadelphia is in no way involved in the liquidation of the J. W. Paxson Co., Philadelphia. The former firm represents a merger of the sand, supply and facing business of the M. R. Taggart & Co., and the J. W. Paxson Co. and since Aug. 1, 1926, the J. W. Paxson Co. has been only in the foundry equipment business.

Foundry Association Directory

American Foundrymen's Association

President, S. W. UTLEY, Detroit Steel Casting Co., Detroit; secretary-treasurer, C. E. HOYT, 140 South Dearborn street, Chicago; technical secretary, R. E. KENNEDY, 909 W. California street, Urbana, Ill.

The Buffalo Foundrymen
Buffalo

President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings the third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, G. H. ROLINSON, American Brake Shoe & Foundry Co.; secretary, ALBERT N. WALLIN, S. Obermayer Co., 2563 W. Eighteenth street. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association

President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
Detroit

President, J. J. BOLAND, Griffin Wheel Co., Detroit; secretary, ROBERT HOPE, Holley Carburetor Co., Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

East Bay Foundrymen's Association
Oakland, Calif.

Secretary, H. L. MARTIN, Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif.

Metropolitan Brass Founders' Association
New York

President, WILLIAM EMBER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by President.

New England Foundrymen's Association

President, HENRY S. CHAFEE, Builders Iron Foundry, Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, WALTER L. SEELBACH, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.; secretary, W. E. DUNN JR., Healy building, Atlanta, Ga.

Pittsburgh Foundrymen's Association
Pittsburgh

President, C. D. CAREY, American Steel Foundries, Pittsburgh; secretary-treasurer, WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, J. H. DIEDRICH, Blackhawk Foundry & Machine Co., Davenport, Iowa; secretary-treasurer, A. D. ZIEBARTH, Davenport Foundry & Machine Co., Davenport, Iowa. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Tri-City Technical Council
Moline, Ill.

Chairman, H. BORNSTEIN, Deere & Co., Moline, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, H. H. NOTT, Smith System Heating Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, south, Minneapolis. Meetings monthly at the Athletic club.

Sprays Dust on Mold

Williams Bros., 1125 West Beardsley avenue, Elkhart, Ind., recently has placed on the market a spray for applying plumbago, flour or parting dust to mold surfaces. The new device, which is shown in the accompanying lilustration, is said to be especially effective in dusting molds which present vertical walls or depressions of considerable depth. The device operates in the same manner as the liquid spray, permitting the operator to direct a fine cloud of flour or dust on any or all parts of the mold. The device enables the operator to apply the powder evenly. A pressure control is incorporated in the spray which makes it possible to adjust the force of the spray to the nature of the work, regardless of the pressure which is supplied for other work in the foundry.

The Device Operates Like a Liquid Spray

Develops New Brake

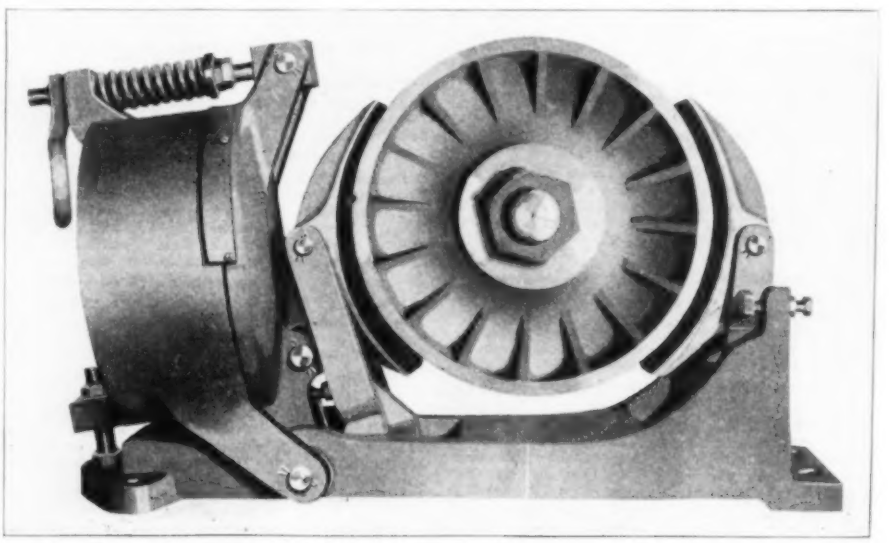
The Electric Controller & Mfg. Co., 2700 East 79th street, Cleveland, has developed a new brake which will permit quick removal of the motor armature with the brake wheel in place and without the necessity of taking the brake apart or disturbing any of its adjustments. A feature of the new brake is the fact that no levers or rods pass over the top of the brake wheel. The brake shoe arms are caused to operate in opposite directions by a simple lever movement having the connecting link within the base below the wheel. Steel castings, machined carefully, and oversize bearing pins are used to give smooth operation. Brake shoe linings are asbestos interwoven with wire and molded into shape under heavy pressure. The linings are ½-inch thick on the smallest size brake and ¾-inch thick on the largest size. A view of the brake is shown in the illustration presented at the bottom of the page.

Truscon Steel Co., Youngstown, O., has removed its San Francisco office to the Sharon building, 55 New Montgomery street.

Window Weights Made in Permanent Molds

Question: I have started a small foundry to take care of the miscellaneous casting requirements of this district and in the belief that there is a promising field for window weights, provided I can meet competition, I shall appreciate your advice on the best method to adopt for molding these castings. I have been informed the castings are made in permanent molds. If that is the case will you kindly inform me where I can buy a mold.

Answer: Window weight castings are made according to several methods horizontally and vertically depending almost altogether on local conditions and the tonnage involved. All these methods were described in considerable detail in a series of articles that appeared in THE FOUNDRY consecutively from March 15 to June 15, 1924. Each foundryman who is interested in the production of window weight castings by the permanent mold method makes his own molds. Even if you propose to make the castings in large quantities we doubt if you would find the permanent mold process profitable. Considerable expense is involved in the preparation of the molds and unless they are poured from a suitable grade of iron they are liable to crack the first or second time they are used. Basing our opinion on your statement that you are operating a small foundry we suggest that the most economical method to adopt in your case is to mount the patterns on a matchplate and make the molds on a squeezer machine. These castings are made also by tiering horizontally in a large flask where the patterns are pulled through a plate at the end.



THE MOTOR ARMATURE MAY BE REMOVED QUICKLY

Summer Brings Sales Decline

Seasonal Influences Cause Slight Slackening in Equipment Demand in June—Manufacturers Anticipate Increase in Buying Shortly

SALES of foundry equipment throughout the country declined slightly in June compared with the total volume of business closed in May. The decrease in demand for equipment is attributed chiefly to seasonal conditions and to the usual inactivity among buyers which accompanies the vacation period. However, manufacturers of equipment feel that interest in new equipment will increase shortly.

The equipment market in the Chicago district shows a spotty tendency in regard to both sales and inquiries. While several lines are fairly active, others are exceptionally slow. June business fell slightly behind the total for the preceding month. Practically all business now being closed represents additions to present operating equipment.

Demand in the eastern foundry equipment market continues slack. A feature of the market has been the placing recently of some business by foundries that are installing small equipment to take the place of heavy equipment uneconomical to operate under the dull conditions prevailing.

Conditions in the New England Market continue spotty. However, men of the trade feel that prospects are good for satisfactory business during the second half of the year. Buying at present practically is for replacements only.

Both inquiries and sales declined during the past month in the Cleveland territory. Several manufacturers report that while a fairly large number of orders were received, many called for small units and the volume of actual business was not large.

CHICAGO MARKET

Core Ovens

Kohler Co., Kohler, Wis., continuous conveyor core oven for gray iron foundry from Young Brothers, Detroit.

Mold Ovens

American Manganese Steel Co., Chicago Heights, Ill., mold oven from Young Brothers.

Molding Machines

Baker-Perkins Mfg. Corp., Saginaw, Mich., Beloit Iron Works, Beloit, Wis., one portable type sand throwing machine each, Crane Co., Chattanooga, Tenn., one sand throwing machine from the Beardsley & Piper Co.

Sand Preparing Equipment

Tulsa Iron Works Co., Tulsa, Okla., one sand separator and blender from the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

Laporte Foundry Co., LaPorte, Ind., one sand mixer from the Standard Sand & Machine Co., Cleveland.

P. H. & F. M. Roots Co., Connersville, Ind., Henry Vogt Machine Co., Louisville, Ky., sand separator and blender from the Royer Foundry & Machine Co., Wilkes-Barre, Pa., through the Fenton Supply Co., Dayton, O.

Shakeout Equipment

International Harvester Co., Milwaukee, knockout machines; American Foundry Co., Indianapolis, Weil-McLain Co., Michigan City, Ind., Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., Lakey Foundry & Machine Co., Muskegon, Mich., Campbell, Wyant & Cannon Foundry Co., Muskegon Mich., Nash Motors Co., Kenosha, Wis., Rundle Mfg. Co., Milwaukee, vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland.

CLEVELAND MARKET

Furnaces

Star Foundry Co., Troy, O., American Foundry & Machine Co., Hamilton, O., Walworth Run Foundry Co., Cleveland, one furnace each for attachment to oven, from the Mayor Fuel Saving Equipment Co., Cleveland.

Molding Machines

Nickel Plate Foundry Co., Cleveland, tractor type sand throwing machine; Holmes Foundry Co., Port Huron, Mich., four; Valley Mold & Iron Co., Hubbard, O., one sand throwing machine from the Beardsley & Piper Co.

Sand Preparing Equipment

Variety Iron & Steel Works, Cleveland, one sand mixer to be included in unit for Grabler Mfg. Co., Cleveland, from the Standard Sand & Machine Co., Cleveland.

National Tube Co., Lorain, O., General Fire Extinguisher Co., Warren, O., one sand separator and blender each from the Royer Foundry & Machine Co., Wilkes-Barre, Pa., through the Mayor Fuel Saving Equipment Co., Cleveland.

American Radiator Co., Buffalo, Caldwell Foundry & Machine Co., Birmingham, Ala., Canadian General Electric Co., West Toronto, Ont., one sand separator and blender each from the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

Shakeout Equipment

Ferro Foundry & Machine Co., Cleveland, six shakeout bails; Henry Furnace & Foundry Co., Medina, O., O. S. Kelly Co., Springfield, O., Great Lakes Foundry Co., Port Huron, Mich., U. S. Radiator Corp., Detroit, Holmes Foundry Co., Port Huron, Mich., American Radiator Co., Buffalo, vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland.

PITTSBURGH MARKET

Furnaces

Mackintosh Hemphill Co., Pittsburgh, Duquesne Steel Foundry Co., Pittsburgh, one furnace each for attachment to oven, from the Mayor Fuel Saving Equipment Co.

Molding Machines

Standard Sanitary Mfg. Co., Pittsburgh, one sand throwing machine from the Beardsley & Piper Co., Chicago.

Shakeout Equipment

Conemaugh Iron Works, Blairsville, Pa., vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland.

NEW YORK MARKET

Molding Machines

Consolidated Machine Tool Corp. of America, Hilles & Jones plant, Wilmington, Del., locomotive type sand throwing machine from the Beardsley & Piper Co., Chicago.

Sand Preparing Equipment

Hudson River Foundry Co., Poughkeepsie, N. Y., one sand mixer from the Standard Sand & Machine Co., Cleveland.

NEW ENGLAND MARKET

Ladles

Chapman Valve Mfg. Co., Indian Orchard, Mass., Scovill Mfg. Co., Waterbury, Conn., pouring devices from Whitehead Bros. Co., Providence, R. I.

Molding Machines

Brown & Sharp Mfg. Co., Providence, R. I., locomotive type sand throwing machine from the Beardsley & Piper Co., Chicago.

New Trade Publications

DRAG SCRAPERS—Link-Belt Co., Chicago, has issued a small catalog describing its power hoe or drag scraper for storing materials. Advantages obtained by use of the scraper are given. Illustrations of the scraper and accessories are presented.

FLEXIBLE SHAFTS—Stow Mfg. Co., Binghamton, N. Y., has published two 4-page bulletins of the loose-leaf type describing its flexible shafts and presenting engineering and other data on them. Illustrations and prices are given.

FURNACES—Electric high-frequency furnaces manufactured by the Ajax Electrothermic Corp., Trenton, N. J., are shown in a folder recently issued. A typical installation is shown and operating data are presented.

MOLDING MACHINES—Various types of molding machines are shown in the recently published 32-page catalog issued by the International Molding Machine Co., Chicago. The catalog is illustrated well. Sizes of the machines are included.

ROTARY BLOWERS—Connersville Blower Co., Connersville, Ind., has issued a revised bulletin on its rotary positive blower. Principle of operation and details of construction are illustrated. A table of net capacities at various pressures is given. Other engineering data are included.

PYROMETERS — Bristol Co., Waterbury, Conn., has published a useful bulletin on the installation and care of pyrometers. The bulletin contains numerous illustrations which amplify the text matter.

ROOFING AND SIDING MATERIALS—The New Jersey Zinc Co., New York, has issued a 40-page catalog showing the use of zinc sheets for roofing and siding industrial buildings. The advantages obtained by using this material are given as are methods of calculating quantity required and methods of construction.

HOISTS—Floor-operated, electric hoists are described in the catalog recently published by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. Descriptions of the various types with illustrations of typical installations are given.

TIERING MACHINES—Revolvator Co., Jersey City, N. J., has issued a bulletin describing its silent chain, spur gear drive model of portable elevator. Details are described and tables of dimensions given.

STEEL LIFT PLATFORMS—Youngstown Pressed Steel Co., Youngstown, O., has issued a series of leaflets and bulletins covering its lift truck platforms and tote boxes. Economy of space by tiering is obtained by angles inside the legs. Crane-hook eyes and pockets for side stakes increase usefulness of platforms and boxes.

GRINDING WHEEL STANDS—Norton Co., Worcester, Mass., has issued a leaflet covering its grinding wheel stands, with motor in the base. Details are illustrated and engineering data and specifications given.

MELTING FURNACES—American Gas Furnace Co., Elizabeth, N. J., has issued a bulletin describing its regular and special melters, with full specifications and data.

PYROMETERS — Taylor Instrument Co., Rochester, N. Y., has issued a pamphlet describing its self-contained pyrometer for determining temperatures of molten nonferrous metals.

TRANSFORMERS—Wagner Electric Corp., St. Louis, has issued a catalog describing its transformers for single phase distribution. The transformers range from 1½ to 200 kilovolt-ampere, with various voltages. Features of construction, sizes and prices are included.

NICKEL STEEL—International Nickel Co., New York, has issued a bulletin describing the application of chrome-nickel steel in special trackwork. Data and specifications of cross-overs, bridge shoes, etc., which are cast from the alloy are given.

AIR CLEANERS—W. H. Nicholson & Co., Wilkes-Barre, Pa., has issued a bulletin covering its devices for removing moisture, oil and dirt from compressed air. Cross-sectional views indicate method of operation. Data are given on the separators and also on three and four-way valves.

POWER PLANT EQUIPMENT—Worthington Pump & Machinery Corp., New York, has issued a catalog describing its pumps, air compressors, steam condensers, oil engines and gas engines for power plants. Illustrations and descriptions of the equipment are given.

TIERING MACHINE—Standard Conveyor Co., North St. Paul, Minn., is distributing an illustrated bulletin describing its hand-power tiering machine. Better use of the cubic storage capacity available gives it value. Full specifications and diagrams are included.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Niagara Machine & Tool Works, 637-97 Northland avenue, Buffalo, will build a 1-story machine shop addition.

Holland Furnace Co., Seventh and Bigelow streets, Pittsburgh, plans to build a 1-story plant at 1111-1129 Behan street.

A. P. Grimm Foundry Co., Bound Brook, N. J., is erecting an addition for the storage of molding sands, etc.

Federal Iron Works, Charles and First streets, Cambridge, Mass., suffered damage to its foundry by fire, recently.

Perkins Brass Co., Porter street, Taunton, Mass., has started its new plant on Ingell street.

National Hydrodrive Co., Binghampton, N. Y., plans to build a pattern shop, and laboratory building.

Evansville Malleable Casting Co., Evansville, Ind., has been incorporated with $100,000 capital by Daniel Wertz.

Bedford Foundry & Machine Co., Bedford, Ind., will build a steel fabricating plant and a machine shop. R. N. Fager is engineer.

Cockshutt Plow Co., Brantford, Ont., will build an addition to its plant, including an extension to the power plant.

Bohn Aluminum & Brass Corp., 2512 East Grand boulevard, Detroit, has awarded the general contract for a 1-story factory building to Krieghoff Co., 4815 Bellevue avenue.

American Malleables Co., Owosso, Mich., has awarded the general contract for an addition to its plant, to Watson & Stevens, Owosso.

Federal Foundry Co., Garwood, N. J., has removed its executive offices to 105 East Front street, Plainfield, N. J. The foundry remains at Garwood.

Kilgore Foundry Co., Newcomerstown, O., J. D. Kilgore manager, is inquiring for metal working machinery for proposed new shop and foundry. (Noted June 15.)

American Art Bronze Foundry, 4921 West Lake street, Chicago, has been incorporated with $25,000 capital to manufacture bronze art works by Lefkow & Lefkow, 58 West Washington street, suite 601, correspondents.

Universal Machinery Mfg. Co., Sacramento, Calif., H. W. Funke, president, contemplates building a foundry near Long Beach, Calif., for the manufacture of steel castings.

U. S. Hoffman Machinery Corp., Syracuse, N. Y., H. W. Stone, 329 Temple street, vice president, plan to build a factory and foundry buildings.

Charles Michael, president and owner, Ohio Crane Co., Bucyrus, O., plans to occupy the Ohio Steel Foundry, recently purchased by him to resume the manufacture of steam shovels.

Hudson Mfg. Co., Hastings, Minn., H. D. Hudson, president, makers of farm machinery and barn equipment, will build a 2-story factory.

Tennant Steel Casting Co., Tacoma, Wash., has bought a controlling interest in the Interstate Foundry Co., Longview, Wash., whose plant just has been completed. J. C. Nunn, formerly of Tacoma, will be in charge.

W. W. Gibson Ltd., Ottawa, Ont., has been incorporated to carry on the business of iron founder, engineer and manufacturer of machinery, with $50,000 capital by Olin A. Beach, Thomas H. Hawkins, Thomas H. Johnston and others.

National Steel Castings Ltd., Toronto, Ont., has been incorporated to manufacture and deal in iron, steel and all other metals with $75,000 capital and 1000 shares of no par value by Norman L. Turner, Thomas A. Brown, Helen Terrill and others.

E. T. Pelton has been appointed receiver of the Gerlinger Electric Steel Casting Co., West Allis, Wis. The company states that the receivership is temporary and that plans are underway to raise additional capital adequately to finance the company.

Operation of the new plant of the Valley Mould & Iron Co., Hubbard, O., will begin within a few days. The new plant built on land adjoining the Hubbard furnaces of Youngstown Sheet & Tube Co. is the largest and most modern of its kind in the world, it is claimed. It will use the entire iron output of the two Hubbard furnaces when operating at 80 per cent of capacity.

Canadian Bronze Co. Ltd., Montreal, Que., has been incorporated to manufacture and deal in bronze, bronze castings, metal alloys, brass, copper, etc. with $1,500,000 capital and 50,000 shares of no par value by Francis C. Dobell, Claude S. Richardson, Herbert W. Jackson and others.

Foster Merriam Co., Meriden, Conn., manufacturer of furniture casters, cabinet hardware and gray iron, brass, bronze and aluminum castings has disposed of the manufacture and sale of its line of casters to the Bassick Co., Bridgeport, Conn. This is done to give room for expansion of its foundry facilities and other departments. It will continue its lines of cabinet hardware, furniture trimmings and specialties.

Organization of the National Bearing Metals Corp., Pittsburgh, with a capitalization of $8,300,000 through the merger of 6 metal companies recently was announced. Companies involved in the consolidation are the Damascus Bronze Co. and the Keystone Bronze Co., Pittsburgh; More-Jones Brass & Metal Co., St. Louis; Bronze Metal Co., New York; Southern Brass Works, Portsmouth, Va., and the Brady Brass Co., Jersey City, N. J. John B. Strauch, St. Louis, was named president of the new firm and Alexander Turner, New York, chairman of the board.

Lancaster Malleables & Steel Corp., Lancaster, N. Y., has been organized and will take over the plant and property of the American Malleables Co., in Lancaster. Work has been started rebuilding the burned finishing department and operations will be resumed at once. W. B. Symmes, New York, is president of the new firm and J. E. Patterson, formerly with the Gould Coupler Co., secretary. Bert E. Weidle, formerly with the American Radiator Co., Buffalo, will be in charge of operations and Frank C. Johnson, formerly with the American Malleables Co., in charge of finance. The American Malleables Co., from which the plant was purchased has another plant at Owosso, Mich.